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Number 82

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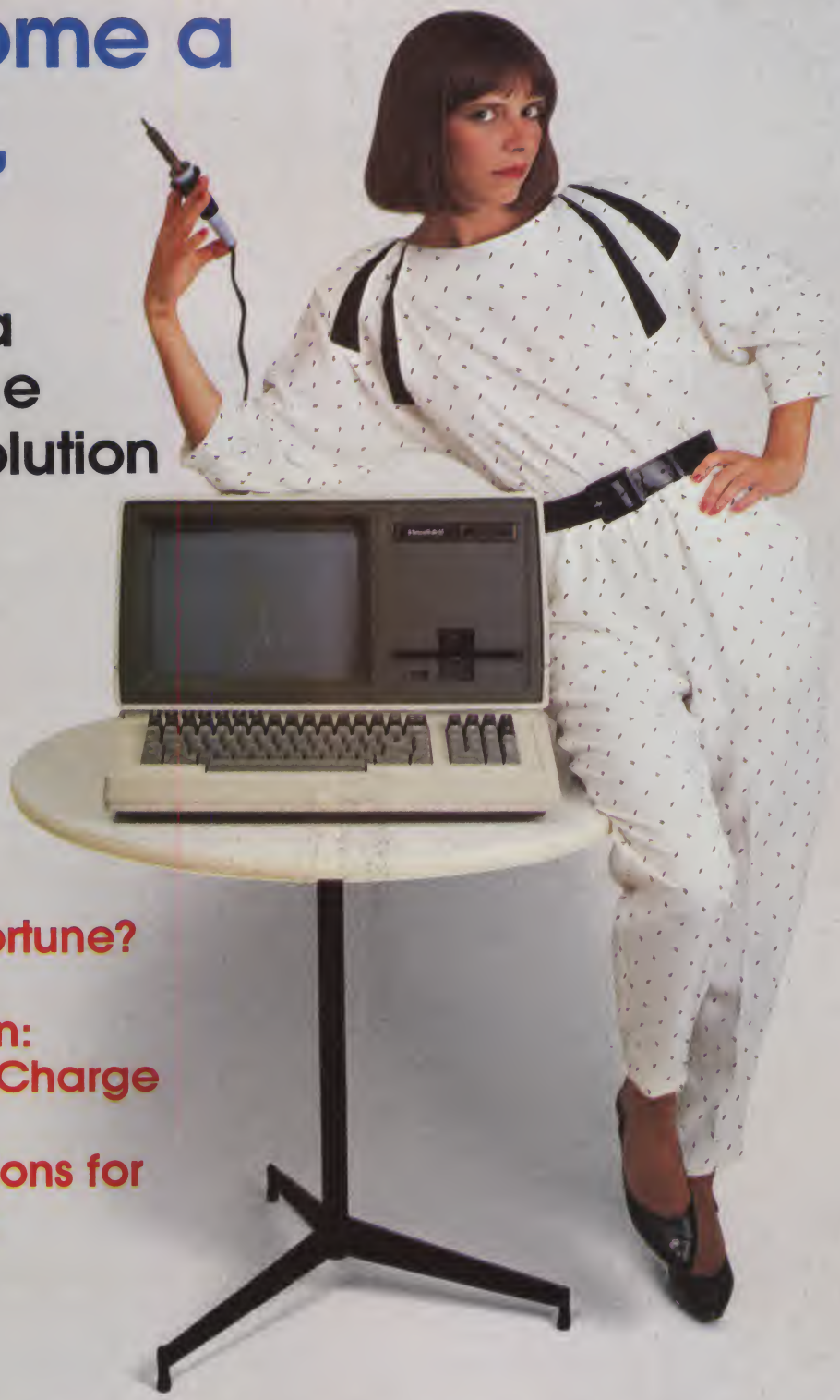

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MICROCOMPUTING

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Filling the generation gap.

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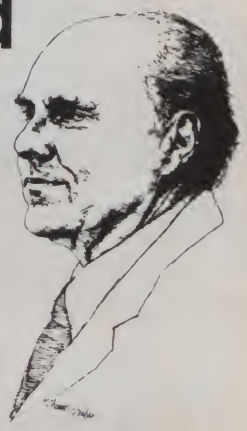
PUBLISHER'S REMARKS

By Wayne Green

Trench Warfare In the Low-End Battle



The Low-End Battle

So far, Radio Shack has tried its best to steer clear of the throat-cutting on low-cost computers. The Shack has responded to some degree, with price cuts and with the release of a cut-down model of the Color Computer as a holding measure against Commodore.

One of the main sufferers has been Timex, which has had to continually drop the price of its 1000/ZX-81 to keep it competitive with the VIC-20, which has many more features. The suffering of both Atari and Texas Instruments, caused mainly by Commodore, was big news. That's a good war to avoid, as long as it doesn't lose too much of the computer market.

But how long can Radio Shack stay out of the war and still have customers coming into its stores? In the long run, there may not be any way to avoid the price-cutting wars.

One approach to solving this problem—and it hasn't seemed to occur to any of the combatants—is a move in a different direction. I haven't seen any signs of this by any of the manufacturers trying to outsmart the others. It's been trench warfare—*á la* World War I.

If one of the firms were to come up with a major improvement in its system—with a feature that none of the others have—it would give that firm a tremendous advantage for a few months. Eventually, the others would copy the improvement and be back on equal ground—unless number one then came out with another innovation to regain the lead.

I modestly bring this up because I have such a series of incredible innovations in mind. Yes, I've contacted the firms and let them know that I have a brainstorm that could save their bacon.

One of the main things I do for a living these days is to come up with innovative ideas. Some firm is going to bite on this idea, and that company could well be the winner of the low-end microcomputer war.

A Winner

So what's going to happen with the new Model 100? This computer is a winner, and we know that other major firms will be out there with strong competition—and soon. I've seen predictions that Radio Shack will be able to sell the 100 with 24K for around $299 retail and still make a profit.

Apparently, we're going to see some larger LCD screens soon, with 80 characters by 24 lines promised. I'm wondering if Radio Shack is going to keep up with what obviously are going to be rapid strides in knee-top computer technology.

The 100 is almost exactly what I described as the computer of the future in my talks to ham and computer groups seven years ago, so I was delighted, but not surprised, when Radio Shack announced it. My 100 goes everywhere with me—it even went around the world a few weeks ago. It allowed me to write letters, editorials and memos while in flight, while waiting for flights, in cars and taxis, and even while sitting beside hotel pools in Bahrain and Amman.

A computer that's this handy has to attract a lot of competition. Can Radio Shack stay on top of the market in features and price . . . or are we going to see a bloodbath in the knee-top field like we did with the low-end computers?

Speaking of the 100, if you read the fine print of the instruction manual for the 100, you'll see that there is a way to completely wipe out the memory in one instant. Well, I managed to find it without the help of the manual, thus wiping out my daily schedule for the next week—a rather long address list, a couple of major business proposals and a few other desperately needed files.

While I'm hashing over the future, let's give some thought to the predicament Ap-

ple is in today. The folks at Apple sure have their hands full coping with disasters. There was the Apple III disaster—a couple of years of development work blown by poor management. More recently, we saw the Lisa announced with great hoopla, only to be scuttled by the wrong price, an inability to run software and a severe case of foot-shooting by Apple's Macintosh development team. In essence, it suggested customers wait for their computer, which would cost a quarter of the price and do almost as much as Lisa. Boom!

If that isn't enough, now we learn that IBM has pushed Apple out of the business market. That stands to reason when one looks at the two systems side by side. It's a little late in history to sell a stack of computer equipment all tied together with cables. IBM is killing both Apple and Radio Shack in this market—and it's the largest market.

That isn't all, folks. With more than 100 Taiwan copiers of the Apple shipping about 50,000 pseudo-Apples a month, Apple is rapidly losing sales in Asia, Africa, the Pacific and even Europe. The company's economies of scale are hurting by this loss of around $200 million in sales to Taiwan. And, yes, there is a simple answer to the problem—again one of outsmarting the foe instead of trying to wear him down with endless legal battles. I've been to Taiwan, I know what has to be done and how to do it, and, yes, I wrote to Apple—and got zero answers.

Getting back to the low-end again, we have Atari, TI, Commodore, Timex and, perhaps, Coleco in the fight. As of this writing, TI got knocked for a loop . . . took a terrible loss and could opt just to give up as it has with its other ventures into consumer marketing.

Atari is in a state of confusion. People are quitting or being fired everywhere and no one knows what's going on. No one, as far as I have seen, has the guts to make any decisions for fear of being fired. Maybe by the time this reaches print, the company will have its act together, and some new models will be released.

Timex has been battered, too. It announced that the TS-2000 is months behind—quality problems, I hear. The TS-1000, being no real match for the VIC-20, has lost heavily in sales, even at give-away prices. Add the Timex disasters in watch sales, and you'll have headaches.

The big winner has been Commodore, with its VIC-20 and 64 systems. Its economies of scale gained through substantial overseas sales made the difference. On the low end, it's a global market—and don't forget it. Radio Shack's weakness overseas has certainly been a factor in preventing a further lowering of the Color Computer's price. Its sales in Asia, Africa, the Middle East and South America are insignificant.

I'm wondering what firm, if any, will be interested in my block-buster innovation. It'll probably be Commodore, since they need it the least. That really would be the crushing blow for Atari, TI and the rest. Maybe no one will go for it—in which case someone else will eventually think of it and everyone will say, good grief, why didn't anyone think of that before?

Horn-Blowing

Question: Who conceived of and started two of the three largest consumer magazines in America?

Folio, the publishing industry magazine, called the other day to let us know that *80 Micro* was third in size in the country in 1982! First was *Byte*, which we started in 1975 and which is now run by McGraw-Hill. Second is *Vogue*, which I did not start.

80 Micro's ranking isn't bad for a magazine about a single product, eh?□

THE EDIT MODE

Back in 1978, when *Microcomputing* was still *Kilobaud*, Dennis Brisson, then a beat reporter for the *Monadnock Ledger*, came on board as an editorial assistant. In 1980, he was promoted to managing editor, and he held that post until our September 1983 issue.

Time for those Dusty Bootheels To Be a-Wanderin'

Fortunately for Wayne Green, Inc., Dennis is still with the company, but with a different publication. Now he can be found down the hall from *Microcomputing* headquarters, in a tiny editors'-lounge-turned-office, where he's spearheading *RUN*. Scheduled to premiere this November, *RUN* will cover the Commodore-64 and VIC-20.

In Dennis's five years with *MC*, the magazine experienced two name changes and several personnel changes. The micro field was growing rapidly all along—it still is—and *MC* changed with it. Through it, Brisson managed to keep *MC* a quality publication.

Even in these days of computer mags and rags popping up all over, *MC* has kept a steady circulation (it's currently at more than 100,000) under Dennis's leadership. And recently, *MC* was rated among the nation's top 400 magazines by *Folio*.

We wish Dennis the best of luck in his new venture. The same goes for *MC* Assistant Editor Swain Pratt, who's also moving to *RUN*. Given the popularity of Commodore machines, and given Dennis' track record, *RUN* figures to be a sprinting success.

Supplement That Income

The fact that *RUN* is a system-specific magazine won't hurt its marketability. That seems to be the trend—if you own an Apple or a VIC-20 or whatever, you're more apt to invest in a magazine that deals exclusively with your system.

The only problem with that is that it makes it tough for you to keep up on the whole micro field. You need to supplement that income of system-specific information with a general-interest publication. *Microcomputing* will continue to fit the bill.

We think *MC* readers who own Commodore machines will make the most of *RUN*, but we hope you'll continue to look our way for general articles, information, applications, programming tips, reviews, new releases and even cartoons . . .

If you have any suggestions, complaints or ideas, let us know. Drop us a line at *Microcomputing*, 80 Pine St., Peterborough, NH 03458.

In this Issue:

As alluded to earlier, the microcomputing field has undergone dramatic changes in the last five years. The micros of the early days are virtually antiques today. Micro technology boomed, and the field went through a revolution, if you will. Micros have come a long way (baby).

We attempted to depict this revolution of sorts on this month's cover. Heath is typical of how micros have evolved. From the bare-bones approach of the H8 to the more sophisticated H89 to its latest and most impressive entry, the H120, Heath has changed with the times.

Although Radio Shack, IBM, Apple and Commodore get plenty of attention (and rightfully so), Heath is the quintessential pioneer and survivor. It has learned from being.

To learn more about Heath's powerful H120, turn to p. 50. *MC* author Martin Moore details the H120 construction process this month, and next month, he'll dig deeper into the features of the H120.

Moore also revisits the H89 and discusses how this computer remains a contender as the micros battle it out.

L.C.
D.M.

OVERVIEW

By Frank J. Derfler

The IBM PC's Missing Link

Give Your IBM A Slice of Apple With the Quadram

This month, I've got some reviews and pieces of news that should be interesting to many different microcomputer users. We'll look at a spectacular system from Kaypro—the Kaypro 10, and we'll examine a clever way to allow your IBM PC to take a byte out of an Apple: the Quadram Quadlink.

But first, let's catch up on some news about July's feature and about the information utility industry.

Okidata + IBM

In July, I wrote about the Okidata Microline 92 and 93 printers and gave some hints on how they can be interfaced with WordStar under CP/M. You IBM PC users should know that Okidata has released a ROM set allowing the Microline printers to use the command set of the IBM (Epson) System Printer. The Plug'N Play kit is available through Okidata dealers (phone 800-OKIDATA); it costs $49.95. The substitution of two chips gives the Okidata printer the ability to respond to programs using the IBM System Printer codes for graphics, like 1-2-3. The Plug'N Play kit makes Okidata/IBM software interface problems simply go away.

Source and CompuServe

Things have been quiet with the information utilities. Most of the activity has been directed into specific areas; the last "big event" we had was the opening of the Source's new computer center.

Staff members at the Source are working hard to attract corporate users for their system. They need to get customers onto their new dedicated equipment during the prime-time workday periods. The folks at CompuServe have a use for their computers during the day (service bureau/remote computing), so they continue to make their service more appealing to private users.

CompuServe's latest contribution to the electronic cottage is a second powerful encyclopedia service. CompuServe is now offering Academic American, published by Grolier Publishing, as an extra cost service. This electronic encyclopedia has a database of nine million words you can search using 27,000 subject entries. You can type in all or part of a word you want the computer to find and the system will create a menu of all articles containing the word. You can either skim through the articles or stop and examine them.

I believe that an electronic encyclopedia is one of the best marketing tools an information utility can have. A sales person can make a good argument for an electronic encyclopedia based on economics, utility and benefit to the entire family.

CompuServe has offered the *World Book Encyclopedia* for nearly a year, and I know my family has used it extensively. The service is fast, easy to use and authoritative. I'm sure we're ahead financially by using the electronic system instead of buying the hardcover books. The cost-per-access of an electronic system is low compared to the cost of buying the books yourself.

The people at the Source have talked about putting an encyclopedia on-line for several years, but they have never done it. CompuServe now has two different encyclopedias with slightly different formats. On the other hand, CompuServe's electronic mail is barely useable, while the Source offers an excellent system. If one or the other would combine both features—research information and electronic mail—they would gain a strong competitive edge.

The latest feature from the Source is in line with its corporate need to develop business among businesses. The Source has developed Stockcheck, a new service that provides the latest price quotation and other information on your portfolio of stocks. This service has particular appeal to investors in today's fast-moving markets.

If you're interested in electronic encyclopedia services from CompuServe, call 800-848-8990. If you'd like to know more about the Source's Stockcheck feature, call 800-424-9494.

IBM Bytes Apple!

Quadram Corp. has become well-known for its IBM PC add-on boards. One of its latest products is a board for the PC that actually gives it the full capabilities of the Apple II and Apple II Plus systems. An IBM PC with the Quadram Quadlink in one of its slots can read and write Apple II disks and run the majority of Apple II software.

The Quadlink board inserts into one of the expansion slots on the IBM PC or XT. It connects internally both to the speaker and to the IBM floppy disk controller. A separate external connection routes the output of the IBM video board through the Quadlink. The Quadlink provides the connection for the standard IBM monitor or for an RGB color monitor.

The board itself contains a 6502 processor, 80K of RAM, input/output controllers and video circuitry. The RAM is loaded with the monitor and DOS from a disk drive. This configuration gives you 64K of useable RAM.

The Spooky Part

When you enter the Apple mode, Quadlink takes over control of disk operation and video presentation. For all practical purposes, you have an Apple II computer. The really spooky part is that you can start a program working in the IBM mode, jump over to the Apple mode and work on a program there, and jump between the two active and working processors with a single keystroke.

Quadlink can move text and data files between IBM and Apple disk formats, thereby serving a useful role in house-

The author can be contacted at PO Box 691, Herndon, VA 22070.

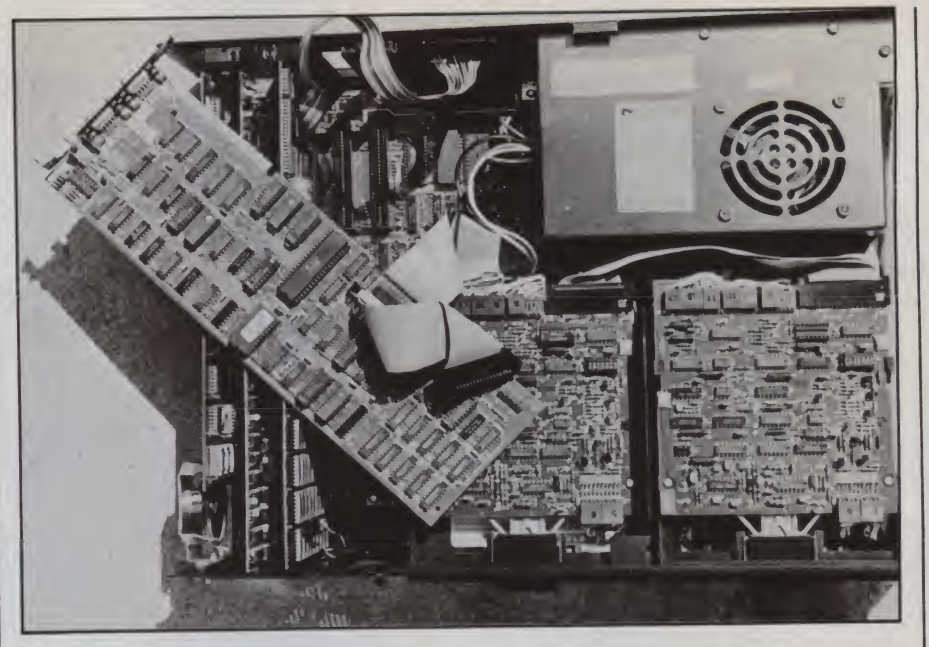
holds and businesses having both kinds of machines.

I have a Quadlink in my PC and it works well. I've run many Apple communications, word processing and applications programs without a glitch. I do have one Apple program I don't run on the Quadlink; it uses a special joystick port plug to prevent duplication.

The Quadlink has a joystick plug, but it is on the card and located in such a position that, once you plug the joystick in, you never want to unplug it again. If you have an important program that uses this copy-protection technique, you'll probably have to choose forever between using that program and using the joystick.

The Quadlink package comes complete with connecting cables and integrating software. It carries a retail price of $680.

If you want more information on Quadlink, contact Quadram Corp. at 4357 Park Drive, Norcross, GA 30093 (phone 404-923-6666).



The Quadlink from the Quadram Corp. gives the IBM PC the ability to read and write Apple II disks and to use Apple programs. The board contains a 6502 processor and its own system memory. Video and disk controller circuits interface the Apple operating system into the PC's hardware.

Kaypro 10

Microcomputing gave you an in-depth review of the Kaypro II portable computer in December 1982. I still think this system represents the best hardware/software value in the market today. But the transportable market is getting crowded. The knee-top machines (Epson HX-20, Tandy Model 100) are challenging the transportables, and the challenge will get really serious when the knee-toppers start to use the 256K RAM chips just coming into the market.

Kaypro is up to meeting this challenge. Its logical move is to provide a product that continues to have the best cost/feature ratio while offering even greater improvements in performance. This product is the Kaypro 10.

The 10 has the same fine display and keyboard as the Kaypro II; these human interface points are among the best in the industry. And it adds a feature that makes the machine both unique and valuable—a ten-megabyte hard disk.

Large hard disk storage devices are valuable as we move toward the era of database management, function generation and easy-to-use applications software. Large help files, graphics menus, user-query languages and other modern software features eat up storage space. As the price of storage devices continues to drop, programmers will use ever-larger overlays and data files and users will expect ever-increasing sophistication.

These factors all point toward the need for a fast and large storage capability. The Kaypro 10 has the capability you need to meet future database and applications software requirements. All of this capability comes with a large collection of software and a low price: $2795.

Physically, the Kaypro 10 doesn't look much different from the II. It shares the same cabinet, but it has only one slimline floppy disk drive, as opposed to the two full-sized drives on the II. A single red light on the panel tells you when the hard disk is working. An attractive and functional chrome-plated ball swings out from the bottom of the machine to prop it

The Chaplin character licensed by Bubbles, Inc., S.A.

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(Write a program for the IBM Personal Computer.)

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And if you write a program using our Advanced BASIC, you'll find the DRAW command particularly appealing. It's virtually a separate graphics language *within* a larger language.

Put your visual together with both the characters and symbols in ROM for a simultaneous, text-and-graphics mix.

Have musical accompaniment as well.

It's easy, because BASIC controls the built-in speaker with a single command.

Utilize the ten, programmable function keys. Try F3 to paint. F4 for lines. F5 for circles. Or F6 for boxes.

IBM PERSONAL COMPUTER SPECIFICATIONS

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Auxiliary Memory
2 optional internal diskette drives, 5¼" 160KB/180KB or 320KB/360KB per diskette

Keyboard
83 keys, 6 ft. cord attaches to system unit
10 function keys
10-key numeric pad

Diagnostics
Power-on self testing
Parity checking

Display Screens
Color or monochrome
High-resolution
80 characters x 25 lines
Upper and lower case

Operating Systems
DOS, UCSD p-System, CP/M-86†

Languages
BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL

Printer
All-points-addressable graphics capability
Bidirectional
80 characters/second
18 character styles
9 x 9 character matrix

Permanent Memory
(ROM) 40K bytes

Color/Graphics
Text mode:
16 colors
256 characters and symbols in ROM
Graphics mode:
4-color resolution: 320h x 200v
Black & white resolution: 640h x 200v
Simultaneous graphics & text capability

Communications
RS-232-C interface
SDLC, Asynchronous, Bisynchronous protocols
Up to 9600 bits per second

Remember that these function keys make your program more "friendly" to the user and, therefore, more appealing to us.

In fact, if you're interested in licensing your software, we could be interested in publishing it.

We could also be interested even if it runs on *another* computer. If we select your software, we'll ask you to adapt it to our system.

So if you think your software is close to picture perfect, consider sending it in.

For information on how to submit your completed program, write: IBM Personal Computer, External Submissions, Dept. 765 PC, Armonk, New York 10504.

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The Kaypro 10 personal portable computer with ten-megabyte hard disk memory.

up for operation. The keyboard is free to be placed on your lap or in any other comfortable position.

Electronically, the main surprise in the Kaypro 10 is an improved graphics capability. The screen is divided into 100 vertical and 160 horizontal pixels. These picture elements can be addressed individually to create charts, graphs and game elements.

The screen display can provide reverse video, underlining, blinking characters and protected fields. These capabilities have many uses in both the design and display of data entry forms and reports and in remote data processing.

The major question that people ask about the Kaypro 10 is how well the hard disk travels. In the past, hard disk drives have had a reputation for poor reliability, particularly when they were moved.

The head on a Winchester technology disk literally flies over the fragile media. If the head should crash into the media, it would destroy any existing data as well as the ability to read and write in that location. Even if the disk has no power applied, the head still can bounce against the media and create damage.

The Kaypro 10 has a utility program called Safety that withdraws the head to a safe position for movement. Users of the 10 probably should run this short program whenever they shut down the system, and certainly before they move it. If you take this simple precaution, you should have no special problems with the Kaypro 10.

Hard Disk and CP/M

Ten megabytes is a lot of space. You can put a great deal of data onto a disk of that size. Actually, the disk system on the 10 has two five-megabyte platters, so the system looks at it as two separate five-megabyte drives (A and B). This arrangement puts an upper limit on the size of a single data file. If you have a six-megabyte data file, you need something bigger than a 5¼-inch hard disk.

It's tough to keep track of the files you'll build up on even a five-megabyte logical disk. The Kaypro 10 uses a Z-80 processor and the CP/M eight-bit operating system. CP/M has limited directory capabilities; if you tried to do a DIR on the usual assortment of files in a five-megabyte space, you would have a lot of confusion. CP/M provides the "User" categories to give you a way to logically arrange files.

The CP/M User command gives you further subdivisions of the hard disk into areas you can define. These User areas really can be for separate users, or they can be for separate functions. For instance, you can put all of your word processing files under User 1 and all of your spreadsheet activities under User 2. As you move between drive A and drive B, you remain in the same user area. This means you can conveniently back up critical files between the two sections of the hard drive, or you can use one drive for data and the other for programs.

However, the small drawback to user areas is that you have to remember where you put each file. I found that nothing beats a 3×5 card taped to the front panel of the machine to help you remember the relationships between functions and user areas. This is crude, but effective.

The Software

You almost need the Kaypro 10's hard disk drive to hold all of the software that comes with it. I'll briefly describe the selection to give you some idea of the value you receive in the initial purchase price.

First, Kaypro provides the Perfect Software family. This includes Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc. These programs use the same commands and share the same file structures.

Perfect Writer is a particularly powerful word processor with split-screen presentations and many other features. Perfect Speller gives you a 50,000-word dictionary, and Perfect Calc has a useful memory management capability that can allow it to create and manipulate large spreadsheets.

Another spelling checker, The Word Plus, is also included. This checker has unique rhyming and look-up capabilities. ProfitPlan, a spreadsheet with powerful mathematic functions, is also on the disk. Two Basic compilers, Microsoft Basic 80 and Kaypro's version of S-Basic, can take care of your programming needs.

Finally, there are some simple game programs that can demonstrate the 10's graphics capability.

That selection of software certainly ought to give you a good start in the application of the Kaypro 10 to your personal or business activities.

A 10 for Value

Kaypro has had a great deal of experience in the production of portable microcomputer systems. It's been an aggressive company in getting some initial bugs out of the Kaypro II.

The 10 has benefited from that experience. It's the combination of a proven design and the latest developments in hard disk technology. The 10 gives you a complete integrated package with all hardware and software at a price that others charge for the hard disk alone.

For more information, or for the name of the dealer closest to you, contact Kaypro at PO Box N, Del Mar, CA 92014 (phone 619-481-3424).

The Future

The near-term development of products in the microcomputer industry will be driven by larger memories and more elegant software. Follow along with us and keep track of the developments.

If you want to contribute on new products you're developing or marketing, drop me a line.□

WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

Program Enhancers

Databases For Every Occasion

Getting Personal

The major new program I promised you is done, and it's available through the Freeware concept. It's called Desktop, and it uses 1-2-3 to make the manager's desk a message-minder, appointment calendar, client-tracker, memo-writer and scratch-pad, all electronically. More below.

We'll have notes from the life of a beta-tester with the new dGraph from Fox and Geller, and in addition, a report on its fine dBase II program writer, QuickCode. We'll also have our usual array of reviews for database software, graphics programs, utilities, games and more.

New Database Programs

dGraph and QuickCode for dBasic II

One of the problems with dBase II, as a seasoned mainframe programmer put it, is "that you just never can get it to do what you want. It's all in there, but you just try to make it work!"

Fox and Geller has introduced two fine programs, dGraph and QuickCode, to do most of the work for you. I've helped shepherd dGraph through three beta revisions, and I can vouch that it's a program you'll want to own if you're a dBase user.

dGraph should be thought of primarily as a graphics query system for dBase files. Say you want a bar (or pie, pie/bar or line) chart of your database "software," and that you want it sectioned by dBase II, by retail price and by type of software. There are ten software types, from (W)ord processing, (D)atabase and (F)inancial to miscellaneous (H)ardware you've bought. Say you'd like to get a report by type and price of program, perhaps broken by less than $100 and more than $100. With dGraph, the problem is simple. You boot the system, and in a *very* friendly way tell dGraph what dBase file to use, what kind of chart you want to draw and what to name the data files it creates. Then you jump over to the "dBase Connection." This dGraph option lets you tell the system that you want it to count (you can also average, sum and do other calculations) the entries in your database by price range (enter Range and then the constraints) and by type (enter List and then the ten types). dGraph examines your dBase file, does the counting and puts the information on the screen or on any one of a number of printers, like the NEC, Prism or Epson (see Fig. 1 for "exploded" pie/bar charts of our report).

That's not all dGraph will do—not by a long shot. Most important for you to know is that it's a stand-alone graphics generator in addition to its dBase abilities; you don't need dBase to run it.

However, since it does only black-and-white charts on printers (although plotter support is coming, says Jake Geller), I think its main usefulness is in making a competent but somewhat unfriendly DBMS program a truly useable graphics report system. Second, there are a lot of dGraph options I can't explore fully here. For instance, you can get inverse plots of any graph (white on black), both on the screen and the printer. And, you can put up to three charts on a single sheet of paper (see Fig. 1 for two on a page).

Furthermore, you can type in a text file to appear at the bottom of each chart with your explanatory text, and dGraph will add it. It also will print the system date on the graphs if you want.

As for shortcomings, dGraph requires that you manually switch to your color monitor before running the program, an unnecessary inconvenience, and it doesn't give you a disk directory to remind you of previously created charts. These features will be added in the next revision, I'm told. An outstanding program!

QuickCode is another useful program for dBase users. It automatically writes dBase programs that will allow recording, editing, rearranging of information displayed, adding of new records, writing of a MailMerge-compatible file for mass mailings and generating of mailing labels. You can make QuickCode's operation as automatic (it will make all of the decisions for you) or as manual (it will write the bulk of custom coding applications) as you wish by turning its automatic pilot on or off.

Essentially, you design the screen layout you want your dBase files to have, and QuickCode will do the rest. There is even provision in record to add, edit and report generation functions to allow you to specify dBase kinds of selective searching, such as telling the program to generate a report only on word processing software costing less than $500.

While it's potentially even more useful than dGraph, I didn't find QuickCode to be as error-free as its cousin in revision 1.2 (this was *not* a beta-test version). When I generated programs, I often got label and report dBase programs that had syntax errors and would not run. Other files worked perfectly, however. Nonetheless, I'd recommend QuickCode highly if you're a dBase II user. It takes what is normally a one-day job, setting up a simple database and manipulating its reports, and makes it doable in an evening. You can't beat that!

Both programs are supported with excellent manuals that are lucid and useful, though in no way "light" reading. Both have on-line help of a primitive but workable variety. Both are available now, and from my interactions with Fox and Geller, user support should be superb.

Cardbox, Data Design, Qbase and More

Cardbox (either DOS, 64K, one disk) is one of those programs that makes you wonder why they sell it until you use it—then you wonder how you survived without it. Cardbox is an electronic card index that's amazingly simple to use, works with English commands (such as

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

Add) and is *fast*. It was highly praised in *InfoWorld*'s recent review, and no wonder! Draw a form on the screen (a line drawing is supported) with headings for each field you want. Enter data from the forms, and retrieve data on the forms.

The useful thing is that you're allowed as many multiple forms for your database as you want. It can create a mailing label form, for instance, that takes only *some* of the information from your "Rolodex" file to write letters. In addition to this forms flexibility, Cardbox really shines in the areas of searching and sorting. It has a number of commands that allow you to include or exclude records in a searched set on the basis of criteria, and you can apply such inclusions and exclusions repetitively to "shape" your extracted records to your needs. The program records and can show you the "history" of your searches, so that you can modify it, change it or even undo it.

The documentation is about the best I've seen, with a complete tutorial and well-written reference manual, all boxed with the disk in a (what else?) cardbox. The program is menu-driven at all points, has extensive recovery capabilities in case you destroy your data file, and has provisions for "exporting" its files in ASCII format useable by other programs.

Since it runs under DOS and is so doggone simple, Cardbox has an almost unbounded range of applications for any task that does not require mathematical manipulation, but rather the tracking of word-type data. Its indexing functions, for instance, are simple and effective, allowing you to index (depending on how you set up the application) by only last names in a multiple name field, by keywords and, generally, by any information that you can enter on the cards.

It's truly a worthwhile offering for the PC; it suffers only from a "tacked-on" conversion style in the documentation, which was written for CP/M users (the function keys *are* used, though).

Unusual Approach

Data Design (128K, two dual disks, either monitor, optionally, a modem) is a competent but unusual approach to DBMS. Its documentation, for instance, is a general coverage book of DBMS design, and it "features" the program in the sense that you get to learn from the authors as they create it, you learn a great deal about data structures and different ways to do things and, maybe, you find out more about DBMS than you want to know. (You don't, for example, get to the program until chapter 3 of the documentation. The first two chapters make up a general tutorial on, strange to say, data design.)

The program itself is provided on three disks, and it includes sample data. It is an exceptional programming job in that Data Design's "standard" features include menu-driven commands, multiple forms (like Cardbox) on the same database, interactive help on-line, interactive browse and modify capabilities, arithmetic/numbers capability, multiple keys, security passwords and built-in back-up and data-recovery capabilities. That's not to mention a report generator that allows summing, averaging, computing minima and maxima and the like, or the coup de grace—built-in telephone communications for two people, each using Data Design.

Data Design uses the concepts of "tables" and "forms." The table is field definition, which can be numeric or text data. Once the data structure is defined, you can create custom forms for input and output of your data. So, as in the case of Cardbox, you can create a mailing list form using only part of the data in a much more extensive file. You can even include a form letter in your forms, and get a simple mail-merge capability.

Contrary to most sample applications supplied with database programs, Data Design's example files are useful for teaching and changing to customize them to your needs. Its Mail system, for instance, lets you maintain a customer mailing list that also posts billing and payment transactions to each account. Memos, billed as an electronic mailing system, combines Data Design's features with the phone subsystem built into the program.

Finally, last and best, Calendar is a nice appointment-tracker, with a limited billing system built in so that you can charge those people who use up your time!

Data Design is a most competent program that runs somewhat slowly (it looks to be coded in Basic), but that teaches a lot about data design and represents a generally well-done implementation with useable sample files. Get a demonstration.

Qbase, from the Versaform people, is Versaform's "baby brother." At half the cost of that outstanding DBMS program, it provides certainly more than half the functions.

Like its big brother, Qbase runs under Pascal, is integrated fully with the PC function keys and has a broad-ranging set of automatic filing and data-checking features that make data entry as error-free and easy as can be.

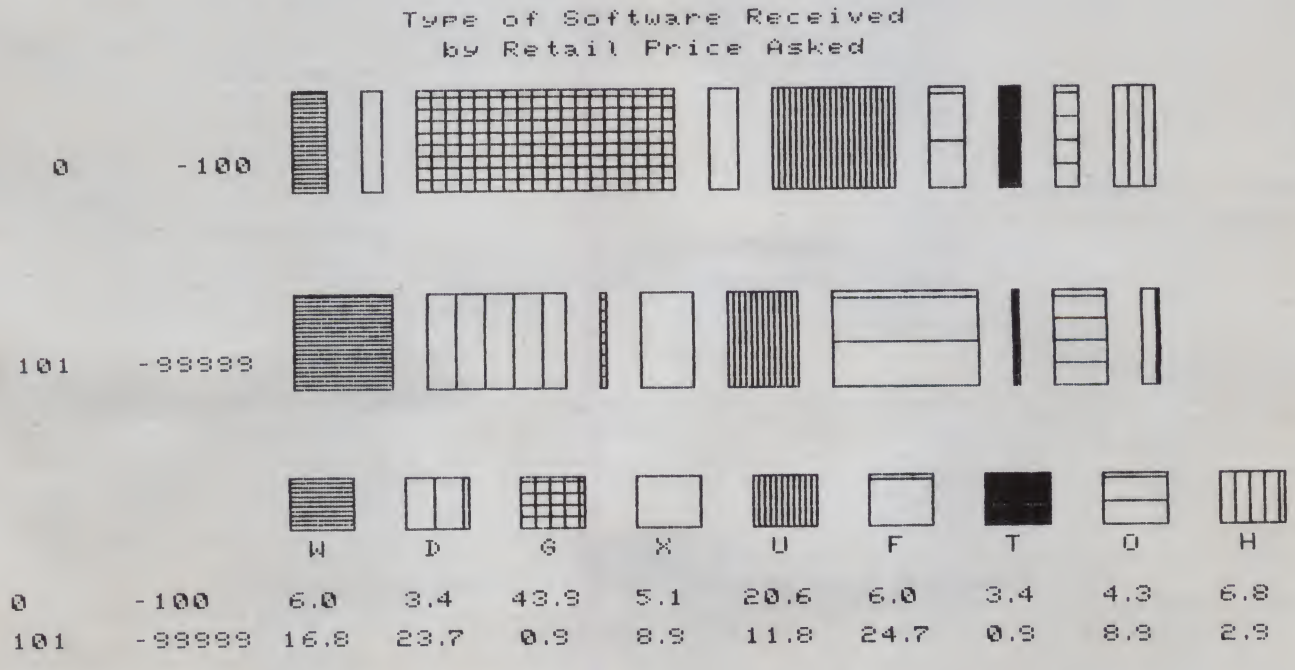

Fig. 1. An "exploded pie-bar" graph generated by Fox and Geller's dGraph.

By automatic filing, I mean that you can tell Qbase to put today's date in the Date field automatically, for instance, although you can override manually if you like. By checking, I mean you can tell it that any entries other than Consulting, Training or Other are illegal for text entries, or that taxes of more than $100 don't make sense and should be rejected. For quick numeric computations on the screen, Qbase has an on-board calculator that lets you extract form information, manipulate it and refile it on the form, all under program control.

All in the Family

The major difference between Qbase and its older brother is that Versaform allows multiple-column-type entries (much like an invoice form) for each record. Qbase doesn't support this facility, which the average user doesn't need unless he's doing inventory, sales or other business management jobs.

Another difference between Versaform and Qbase is in the programs' respective report generation abilities. Qbase has all the "normal" reporting functions (such as full sorting, selection and totaling abilities, subtotaling by field and selection by logical relation), but the fancier "printer forms" of Versaform that allow you to mass-produce invoices are not there. Qbase, though, includes a good mailing label generator.

Like its brother, Qbase is one of the best DBMS programs on the market. Its use of a non-DOS operating system, Pascal, means that you'll have to plan your applications carefully, and that you'll have to be sure that your word processor (Qbase has a great file export facility) is PowerText or another Pascal-based one. If it isn't, you'll have trouble integrating Qbase with other programs you might like to use.

Aside from that caution, Qbase is a cheap way to get 75 percent of Versaform's excellence at less than half the price.

Imagine a Sensible Solution

Imagine a dBase system that wouldn't do anything unless you wrote programs, with no default operations, in compiled Basic, in addition to writing .COM files. That's a little unfair, but it's not a bad description of The Sensible Solution. You have to learn more than 200 new commands (picked by number, not by name), such as SEL.SCN and GOTO.TOF, to use in writing programs that will drive your DBMS input from screens.

The downside of all this is an awesome complexity that would scare almost anybody but a mainframe white socker away from The Sensible Solution. The upside is that The Sensible Solution's "executive" program keeps track of all variables, screens and commands, and can often "know" when to help you out during the creation of subsidiary files (such as a payment one) to support a main file (such as a customer one).

The Sensible Solution seems to function well if you're willing to wade through all of the complexity to learn it; I wasn't. Although the documentation is written with a sense of humor and an eye to computer neophytes, the tutorial alone takes 90 single-spaced pages and makes using dBase look simple!

On the other hand, this system is far more customizable for the applications developer than is dBase, and it doesn't have some of the constraints discussed in a recent *BYTE* review of that system. With The Sensible Solution, we find a combination statement compiler, screen editor, program writer and DBMS that only the user can decide if he can operate. You'll want a long demonstration and, if you can arrange it, a weekend loan on this one before deciding.

Info Information

Info is a program from the Starware people. Now, you get what you pay for, and $39 doesn't buy you so much in our world of bloated software prices. But, if your application requires five lines of data entry or less, or if it falls into the categories of monthly bill tracking, name/address file, personal diary, appointments, insurance records, mortgage/loan records or inventory, Info may be for you.

The program is preconfigured to handle any and all of these applications, and does so (within the five-line limit) well overall. On-line help is available, and it's fast. In addition, you can train Info to handle almost any other filing job you have. No calculated fields or complex search abilities are in this package. Rather, it has just a plain old Basic program that doesn't do nearly as much as PC-File, for example, but is absolutely nonintimidating for the first-time user. Like all of Starware's packages, the written documentation is thin and poorly produced. But the help available on the disk more than makes up for it.

Graphics

PFS:Graph is a graphics program that has as its main virtue full integration with PFS:File and the soon-to-be-released PFS:Write. However, it also works well as a stand-alone system. It handles the usual array of line, bar and pie charts, but nothing more sophisticated (such as text ones or overlays). It outputs on a wide variety of peripherals, including four brands of plotter and the Prism color printer. The program is fully integrated with the PC's function keys, a real plus. And, like all PFS products, the documentation is intelligent, well-written and clear.

Unlike some packages, PFS:Graph allows you to have not just labels, but numeric or date partitions on the x-axis of a graph. You can get your data from a .DIF file (VisiCalc, 1-2-3 or other programs output in this form), from PFS files with a nice set of inclusion/exclusion criteria and from the keyboard. One-hundred-forty-four data points can be displayed on one chart—a minor restriction; up to 36 x-y pairs can be entered—a more serious one.

The program does a nice job on area charts (where you want an area filled in under a line), and does a yeoman job with legends, titles, colors and patterns. While it's not as sophisticated as Chartman, Graphwriter or BPS Business Graphics, it gets the job done.

The real worth of this competently designed program will be clearer when we see the PFS:Write program and learn how the whole four-program package is meant to work together. But, judging it alone, PFS:Graph gives good value for the money.

As the PC matures, we begin to see programs that add CAD-like abilities to the PC's "normal" graphics functions. PC-Draw and Metagraph are two such programs. PC-Draw is useful for flowcharting, organization chart preparation, forms design, office layouts and architectural or mechanical design jobs. It has lightpen support (you buy the pen, they support it), and it uses a series of predefined and user-definable symbol tables to give users an interactive drawing system that is fast, useful and useable.

Multiple fonts are supported for "unusual" lettering, and PC-Draw is supplied with a flowcharting symbol set for software design, an electrical design set and a text menu for alternative text entry. As Fig. 2 (reduced) shows, you're not limited in any way by 8½ × 11 paper, but you can design your chart in "pages" that the system prints for later paste-up.

PC-Draw is easy to use, and very easy to use with a lightpen. It supports expanding, reducing and rotating of symbols and drawings and creates circles, arcs and ellipses at will. You wouldn't mistake it for one of Computervision's $350,000 CAD systems, but it's a real start on the PC, and it's well-coded. Output can be sent to a number of printers, such as the NEC and Okidata, but not to a plotter or color printer as of this writing. The manufacturer claims that the HP7470A will be supported "in the future."

Metagraph, in a lot of ways, is about half PC-Draw and half PFS:Graph. Primarily, it's a business graphics charting system, but it offers significant elements of freehand drawing, symbol manipulation and a "sketchpad" with capabilities not unlike PC-Draw's. As with Chartman and other business graphics systems, Metagraph is forms-driven. You fill out forms pertaining to your graph's appearance, and the program draws it in either medium- or high-resolution mode.

Metagraph uses a number of increasingly complicated menus that you don't need to access in order to produce stan-

Circle 369 on Reader Service card.

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dard charts and graphs. However, if you wish, you can get as fancy with legends and titles as you'd like. I found data entry from the keyboard somewhat awkward and provision for importation of files from other formats overly complicated, although Metagraph supports SuperCalc, dBase and its own file formats.

In addition to the usual line, pie and bar charts, Metagraph has a facility for creating maps or drawings of geographical areas, and it has a good scatterplot facility. It can also handle horizontal bar charts, and it can plot multiple graphs per page.

Among its graphics options is the ability to choose the thickness of the lines with which Metagraph draws (like a paintbrush choice), to grid the chart and to choose how patterns drawn will be filled. Once a chart has been drawn, you have complete control over its size and position on the page; for example, you can invert it if you like upside-down bar charts.

Pretty Up Your Charts

This is only half the story, though, for Metagraph supports a basic and advanced level sketchpad that lets you "pretty up" your charts in a number of ways. The best way to think of the sketchpad is as a set of tools: a ruler for drawing lines; a set of pens with different colors and tips; shapes with different colors and patterns to fill in areas of the pad; two text fonts (italic and standard); and erasers, scissors, files and glue. Oh, there's also an enlarger for making your patterns larger or smaller.

All of these features can be used alone (to make drawings) or on graphs (to customize them). So, with Metagraph (though there are no predefined symbols), you can quickly create the kinds of drawings depicted in Fig. 2 *and* generate business

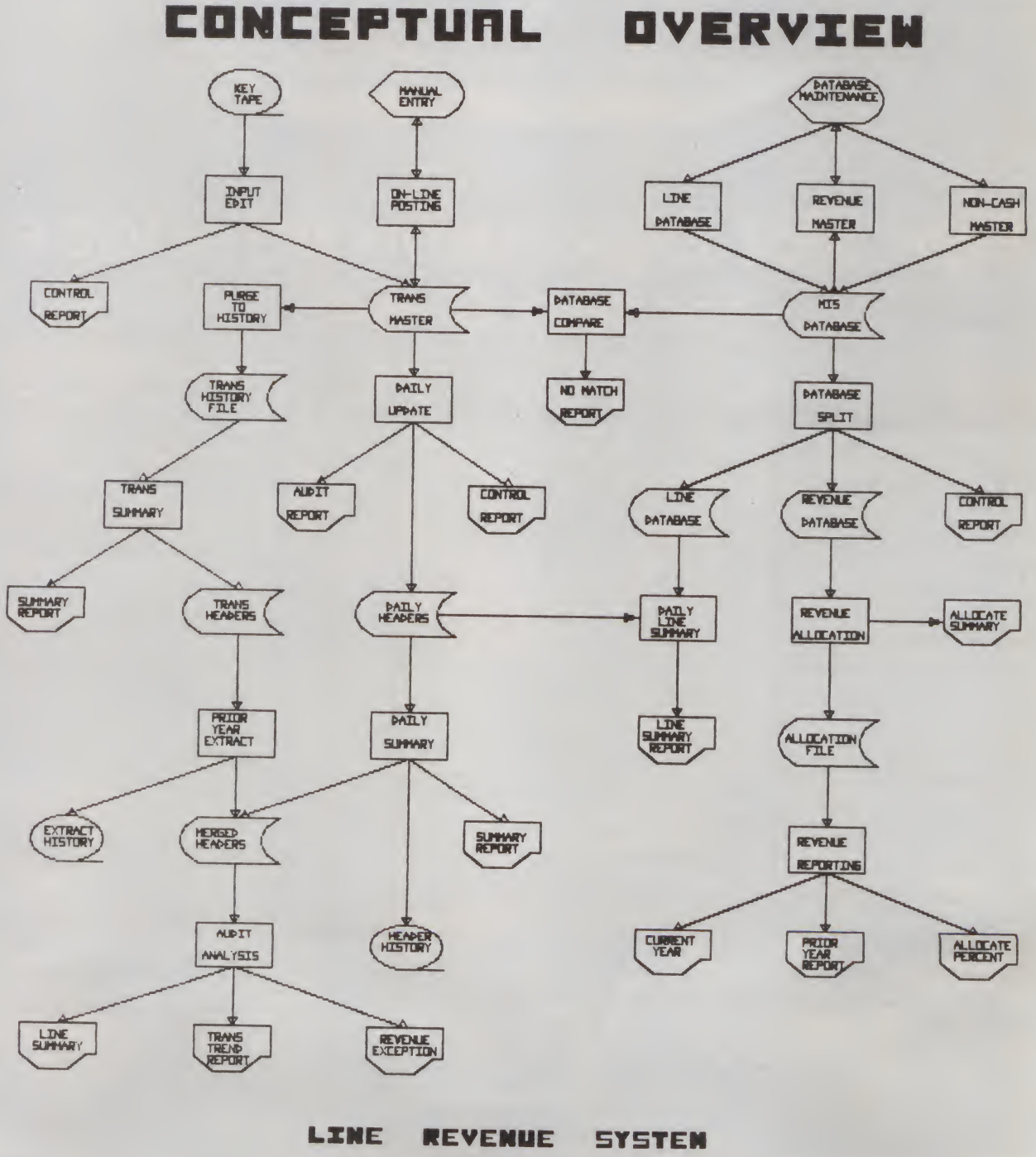

Fig. 2. An illustration of PC-Draw's symbol abilities.

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Gary L. Tooker
Sr. VP & General Manager
Semiconductor Products Sector
Motorola

Jones
High Technology
July 1983

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Frank W. Jones, President
Giddings & Lewis
(unit of AMCA International)

Hall
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August 1983

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Robert C. Hall, President & CEO
Satellite Business Systems

Simon
High Technology
March 1983

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graphics as well.

Metagraph seems to work well and offers an array of options astounding in its extent. The program offers on-line help on demand, a big plus. The written documentation, while 300-plus pages thick, is not as useful as it should be, nor is it clearly written.

For example, the program supports the HP plotter as well as NEC and IBM printers for output, but it took me almost a half-hour to find the particular appendix that told me how to configure the plotter.

Additionally, in choosing line types (DOS 2.0's Basic enhancements let you do this), there is no explanation either in the documentation or the on-line help of what number means what; the Basic 1.1 user won't even know what they're talking about here. There is no index for the manual; it poorly supports what is a good program.

```
2580 LOCATE TITBASE-3,18,0:PRINT CHR$(214) FRM$ CHR$(183) ' 0 with LOCATE turns cursor off
2590 PRINT TAB(18) CHR$(186);:COLOR 15,0:PRINT " W O R D  F R E Q U E N C Y  A N A L Y S I S ";:COLOR 7,0:PRINT CHR$(186) ' OK wit
h either adapter
2600 PRINT TAB(18) CHR$(211) FRM$ CHR$(189)
2610 RETURN
2620 '
2630 ' ---- Error handling ----
2640 IF ERL= 1000 AND ERR=53 THEN RESUME 1030
2650 IF ERL=1000 AND (ERR=52 OR ERR=64) THEN ERRMSG$=FLNM$+" is not an acceptable file name":LOCATE 6,8:GOSUB 2750:RESUME 1080
2660 IF ERL=1000 THEN ON ERROR GOTO 0
2670 '
2680 IF ERR=53 AND ERL=1240 THEN ERRMSG$="No .TXT files on drive "+LEFT$(FLNM$,1):LOCATE 17,8:GOSUB 2750: RESUME 1190
2690 IF ERR=71 AND (ERL=1240 OR ERL=1260) THEN ERRMSG$="The disk drive door isn't closed.  Close it.":LOCATE 17,8:GOSUB 2750:RESUM
E 1190
2700 IF ERL=1260 AND ERR=53 THEN ERRMSG$=FLNM$+" does not exist":LOCATE 17,8:GOSUB 2750:RESUME 1190
2710 IF ERL=1260 AND (ERR=64 OR ERR=52) THEN ERRMSG$=FLNM$+" is not an acceptable file name":LOCATE 17,8:GOSUB 2750:RESUME 1190
2720 '
2730 ON ERROR GOTO 0 ' If the error handling routine can't handle it, a normal error message is printed
2740 '
2750 IF COLR THEN COLOR 20, 0 ELSE COLOR 31,0
2760 PRINT ERRMSG$;:COLOR 7,0 ' Prints white or red blinking error msg.
2770 FOR I=1 TO 3000:NEXT I:RETURN
2780 '
2790 ' ---- Subroutine to determine adapter and make choices ----
2800 TRUE=-1:FALSE=NOT TRUE
2810 DEF SEG = &HB000 ' Monochrome display memory segment address
2820 GOSUB 3220 ' Check if memory exists at this address
2830 IF LOCATED THEN HASMONO=TRUE
2840 '
2850 DEF SEG = &HB800 ' Color graphics board display memory segment address
2860 GOSUB 3220 ' Check if memory exists at this address
2870 IF LOCATED THEN HASCGA = TRUE
2880 DEF SEG ' Restore segment back to normal (BASIC data space)
2890 '
2900 IF (NOT HASCGA) AND HASMONO THEN CGA=FALSE:RETURN ' Monochrome adapter
2910 IF HASCGA AND (NOT HASMONO) THEN CGA=TRUE:GOSUB 3030:RETURN ' Color graphics adapter
2920 IF (HASCGA AND HASMONO) THEN GOSUB 2960:RETURN
2930 BEEP:END ' Should never happen, but who knows
2940 '
2950 ' ---- Monochrome and color graphics adapter choice ----
2960 CLS:GOSUB 2570: LOCATE 12,12: PRINT "Press 'C' to use color monitor, 'M' for your monochrome display."
2970 LOCATE 14,12,1:CHOICE$=INPUT$(1)
2980 IF INSTR("CcMm",CHOICE$)=FALSE THEN BEEP:GOTO 2970 ' Incorrect entry
2990 IF CHOICE$="C" OR CHOICE$="c" THEN GOSUB 3100 ELSE GOSUB 3160
3000 RETURN
3010 '
3020 ' ---- Color or b&w display choice with color graphics board ----
3030 CLS:GOSUB 2570:LOCATE 12,14:PRINT "Press 'C' for a color display, 'B' for black and white"
3040 LOCATE 14,14,1:CHOICE$=INPUT$(1)
3050 IF INSTR("CcBb",CHOICE$)=FALSE THEN BEEP:GOTO 3040 ' Incorrect entry
3060 IF CHOICE$="C" OR CHOICE$="c" THEN COLR=TRUE ELSE COLR=FALSE
3070 RETURN
3080 '
3090 ' ---- Switches to Color Graphics ( "C.BAS" IBM dealer demo) ----
3100 CLS:WIDTH 80: DEF SEG=0:POKE &H410,(PEEK(&H410) AND &HCF) OR &H20
3110 WIDTH 40:SCREEN 1:SCREEN 0:WIDTH 80:LOCATE ,,1,6,7
3120 CGA = TRUE ' Set for Color Graphics Adapter
3130 RETURN
3140 '
3150 ' ---- Switches to Monochrome ("B.BAS" IBM dealer demo) ----
3160 CLS:WIDTH 40:DEF SEG=0:POKE &H410,PEEK(&H410) OR &H30
3170 WIDTH 80:LOCATE ,,1,12,13
3180 CGA = FALSE ' Set for IBM Monochrome
3190 RETURN
3200 '
3210 ' ---- Memory test subroutine ---
3220 ' Two tests are made with different values.  Memory location is restored to original value
3230 ' Adapted from a routine by Will Fastie, Creative Computing, June 1982
3240 '
3250 LOCATED = FALSE
3260 ORIGVAL = PEEK(0) ' Read original value
3270  ' Test 1
3280 TESTVAL = 0:POKE 0,TESTVAL:TRIALVAL=PEEK(0)
3290 IF TRIALVAL=TESTVAL THEN FIRSTTEST=TRUE ELSE FIRSTTEST=FALSE
3300  ' Test 2
3310 TESTVAL = 255: POKE 0,TESTVAL:TRIALVAL=PEEK(0)
3320 IF TRIALVAL=TESTVAL THEN SECONDTEST=TRUE ELSE SECONDTEST=FALSE
3330  '
3340 LOCATED=FIRSTTEST AND SECONDTEST ' Both tests must be true
3350 POKE 0, ORIGVAL ' Restore original value
3360 RETURN
```

This portion of Tom Bonoma's Wordnew4.bas program was inadvertently omitted from the listing in the August 1983 issue of Microcomputing *(p. 15). Wordnew4.bas is a word frequency analysis program adapted by Bonoma and modified by Peter Baenziger.*

Other Stuff

You'll notice I seldom, if ever, review telecommunications programs in this column. That's because I've never found a program I thought could compare to Andy Fleugelman's PC-Talk, an absolutely outstanding program.

Well, it took the Hayes people to do it, but Andy's got some competition, and at only twice the price! Smartcom II is a fine program that automatically does just about every telecommunications job you could ask of it. After booting it and configuring it correctly, you can get to the Source command prompt with precisely three keystrokes. The program does the modem set-up, dials the number, logs you in, gives your password and even responds to the initial Source menu. You never touch the keyboard.

Hayes' Smartcom II is just awesome, and, at $60, is a bargain.

What it can do with the Source, Smartcom can do with any other service; you have 26 at your fingertips (menu-driven) at one time. The program also has provisions to download, upload and print files for you, and it allows parameter changes on everything from answer on ring 2 to delay character transmissions by variable amounts. A full set of macros is supported for your on-line needs so that Alt + A can become POST C R IBM, for instance, to get you to the IBM classifieds on the Source.

You can configure your system in any way you'd like, and the program will even issue a full set of reports about how you've configured it, who to dial when you tell it to and what it will do. A good troubleshooting guide is provided in the manual, as are a set of BBS phone numbers across the country. If that isn't enough, there is an outstanding on-line help facility as well.

The program is just awesome, and, at $60, is a bargain.

Spell-It

Even better in terms of value (if that's possible) is Spell-It, from Berzurk Systems. For $30, it rivals the best spell-

checkers out there, and works with a wider variety of word processors than most.

Spell-It carries a 41,000-word dictionary (not very big), is not copy-protected and shows errors in sentence context so that you can make modifications. Your input file is automatically updated.

Spell-It is supported by several auxiliary dictionaries of proper names, contractions and the like, and all of the utilities to pack files and maintain the dictionary file. It works with WordStar, EasyWriter 1.1 and II and Volkswriter, as well as many other programs. It can be configured to run in color, and it has good documentation.

Playing Games

The closest thing to arcade-quality games I've seen for the PC is from FastNFun Video. Schultz's Treasure is an all-graphics maze adventure that doesn't use words or "N," "S," etc., but instead shows you the maze, the monsters and your tools. With seven levels of difficulty, I've never made it out with the gold, even in level I. It's an interesting game. So is Ultralight Command, a shoot-'em-up with gliders, enemies bombing your boats and outstanding graphics and sound.

Both games require a 64K machine, one drive and a color board. Both work either with the keyboard or a joystick. Ultralight has actual voice transmissions from the PC speaker, with no additional hardware needed.

I'd also recommend Flipperball from Cypress Software. It's a solid pinball

The "Big Blue" Black Book

Prices, Addresses of this Month's Featured Products, Companies

Cardbox ($250)
Micro-Technical Products
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Mesa, AZ 85201

Data Design ($239)
Insoft
10175 S.W. Barbur Blvd.
Suite 202B
Portland, OR 97219

dGraph ($295)
QuickCode ($295)
Fox & Geller, Inc.
604 Market St.
Elmwood Park, NJ 07407

Flipperball ($29.95)
Cypress Software
PO Box 8715
Coral Springs, FL 33065

Graphmagic ($89.95)
Mathemagic ($99)
International Software Marketing
Suite 421, University Building
120 E. Washington St.
Syracuse, NY 13202

Info ($39.95)
Starware
2000 K St.
Washington, DC 20006

Metagraph ($250, average)
Graphicon Software
399 Sherman Ave.
Palo Alto, CA 94305

PC-Draw ($250)
MicroGrafx
8256 Vista Drive
Dallas, TX 75243

PFS:Graph ($140)
Software Publishing Co.
1901 Landings Drive
Mountain View, CA 94043

Qbase ($189)
Applied Software Technology
170 Knowles Drive
Los Gatos, CA 95030

Schultz's Treasure ($34.95)
Ultralight Command ($39.95)
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Tempe, AZ 85282

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5923 Peachtree Industrial Blvd.
Norcross, GA 30092

Spell-It ($29.95)
Berzurk Systems
1434 Parker St.
Berkeley, CA 94702

The Sensible Solution ($695 single user)
($995 multiple user)
O'Hanlon Computer Systems
11058 Main St.
Bellevue, WA 98004

WordPerfect ($495)
Speller ($145)
Sorter ($95)
Satellite Software International
288 W. Center St.
Orem, UT 84057

game that has few frills, but it's darned tough to master.

Before we turn to Desktop, let me tell you about two revisions that have come to my attention.

Version 1.7 of Graphmagic and Mathemagic are now on the streets, and they now support RAMdisks, hard disks and the 8087 coprocessor. Additionally, the programs allow data input from dBase and SuperCalc files, making two good packages even better. And, from SSI International is revision 2 of its nearly perfect word processor, WordPerfect.

What's new here? Well, the older NEC series of printers is now supported, which is important to me since I own one. A spelling-checker is now included (optionally) with WordPerfect, as is a sorter to select records from merge files (e.g., name and address files) for form letter generation. It's hard to believe they did so much to a package that needed so little! Now, if they'd only support true proportional printing . . .

Desktop

Desktop is just that—a program meant to be left on the manager's desk to organize his day. It requires that you own the Lotus 1-2-3 program; that's what it runs under. The program is completely menu-driven, and it makes extensive use of macros and other devices in a way completely transparent to the user to allow automated entry of appointments, messages, client-tracking and memo- and letter-writing. A "Scratchpad" area for spreadsheets and graphs is supported as well.

When you enter Desktop, you're shown a menu that allows you to enter one of the five applications shown in the program or to read the instructions (they're on line at all times). The main menu can be rerun at any time by hitting two keys. All printing is controlled by a print menu, and you can find messages and appointments automatically via a "find-it" menu.

The message board allows the user to enter the categories of messages, date, person, matter, address and whether the message has been "cleared" or dealt with. Entry is accomplished with two keystrokes that automatically invoke a macro to automate the date and the other required entries. The user can search the messages list from another menu and find all messages that deal with "consulting," for instance.

The appointments and client workspaces operate similarly, but with different headings and layout for the different purposes. Desktop always drives the manager toward action; no appointment is concluded until some action results from it, and the spreadsheet reflects this fact. For client-tracking, the date, time spent with the client, matter and resulting action are recorded. All of these entries are accomplished automatically with macros.

The memo- and letter-writer allows short compositions (two to three pages) from within 1-2-3, with semi-automatic justification of entered text. The program automatically dates the memo and supplies required headers and footers, as it does for all printing jobs.

Finally, Scratchpad is an "open area" in which spreadsheets can be constructed and graphs plotted at will. Alternatively, the manager may wish to use this area to take notes.

Desktop is supported with a sample data file and a documentation file in addition to its on-line instructions. It is being marketed under the Freeware concept. That is to say, users who would like the program should send no money, but a formatted disk and prepaid return mailer to Microcomputer Management, 45 Drum Hill Road, Concord, MA 01742, and they will receive the program and documentation free.

If the program is useful to them, they are asked to send a $20 donation to the author. This will register them as owners, and assure their notification of future revisions. Alternatively, users may send the $20 donation directly, and we'll supply the disk as well as pay the mailer cost and freight.

As they say, "What have you got to lose?"□

By Robert W. Baker

Exterminating Basic Bugs

A Few Tips On How to Get Errorless Programs

Debugging Hints

It's inevitable. After you've spent all that time copying a program from a magazine or writing a program from scratch, it usually doesn't work right the first time. It happens to the best of us, no matter how hard we try to think of every flow through a program, or how carefully we type in the program. Mistakes are bound to happen, and finding them is not always easy.

Whenever a program doesn't do what it was intended to do, there are two kinds of errors that could be causing the problem. The first is the typing error, which occurs while you're entering the program. The second is the logical error, where the program just doesn't do what you intended, even though Basic doesn't detect or report an error.

Typing and Programming Errors

Typing errors usually are easy to find. You'll catch most syntax errors the first few times you try running a newly entered program. Basic will indicate that a syntax error was found and show where it occurred.

Other programming errors usually are caught by Basic when the program is run. The error message displayed generally will flag the type of error and the line where it was detected.

The error descriptions in the Commodore manuals should give you a clue as to what caused the error. Just as before, list the line in question and carefully recheck it.

Some errors, however, indicate only where the error was caught—not where it was caused. If you see an Out Of Data error message, it will indicate the line where the Read occurred, but the real problem might be in your Data statements. You might have omitted some of the data, quotation marks or the separating commas. Or you could have tried to read too much data.

If a particular error message doesn't seem to make much sense, look for lines with related commands elsewhere in the program. For example, A Bad Subscript Error might be due to a wrong DIM statement.

As I said before, most of the problems caused by typing errors usually are easy to find. However, consider the case where you've mistyped a variable name somewhere in your program. Basic won't catch the error, since it doesn't know you really meant X = 123, instead of Z = 123. The program will run without displaying any error messages, but odds are that the program will not run correctly. How do you find this kind of problem?

Sprinkling Print Statements

The procedure I usually follow is to generously sprinkle print statements throughout a program to display the values of key variables. You might even want to include a short description of the value and the line it's being reported from. Then, by analyzing the values displayed, you can sometimes spot a problem area and take a closer look at the lines in question.

Another idea is to insert a stop command at various points in the program to halt program execution and to return to immediate mode. From the keyboard, you can then display or change variables, list program lines, continue execution and so on.

Keep in mind that you cannot continue execution once you edit any line in the program. If you make a change anywhere, you must restart the program, since all variables are lost. Be especially careful when listing program lines; if you hit the return key with the cursor positioned on any program line, Basic will think you've edited that line!

This is all well and good if you have some idea where the problem exists. Remember—you cannot edit a program and then continue execution. This means the stop or print commands you need for debugging have to be inserted before you run the program. You normally won't be able to add extra debug commands after you start running the program.

Also, you'll have to remember where you put all your debug statements, so you can delete them later. It's easy to forget or overlook one.

An even better method is to use conditional debug lines like:

```
100 IF DF = 1 THEN PRINT  "X = ";X:
STOP
.
.
.
200 IF DF = 2 THEN PRINT "Y = ;Y:
STOP
.
.
.
300 IF DF>10 THEN STOP
```

By testing the value of a special debug flag (like DF above), you can conditionally print variable values and/or stop program execution at selected points in the program. (Remember—you can change the value of variables and still continue execution as long as you don't edit the program.) Each time you hit a debug stop, you can easily change the value of the debug flag to select the next debug point desired.

Besides being able to dynamically change your debug tactics while executing a program, this method has one other big advantage. With the right conditional tests of the debug flag, you can even leave your debug statements in your finished program. If you suspect problems in the program at some future time, all of your previous debug tools will still be available. This assumes, of course, that you have enough memory space to keep the debug statements in the program, and that the added lines don't adversely affect the execution speed of the program.

To make things easy, I would suggest

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using debug values other than zero for triggering debug events. Then, if the debug flag is not defined and it defaults to zero, the debug statements will not be executed. To start a debug session, simply define the flag from the keyboard in immediate mode and use a goto statement to start the program. Whenever you use a run statement, the debug flag will default to zero and will not affect the program.

Where to Insert Debugs

The only hard thing is deciding where to insert debug commands within your program. You might try the beginning of each major portion of the program, subroutine entries or exits, beginnings and ends of loops or even the middle of a loop. It all depends on how the program was written and what kind of a problem you're trying to find.

For really tough problems, a number of trace utilities are available from different sources. These programs normally display each line number as it's executed so you can follow the flow of your Basic program step by step. Fancy versions may even display variable values or have other special features.

Trace utilities are powerful debugging tools and can be extremely useful. On the other hand, it can take quite a while to trace any sizable program.

Commodore-64 Screen Editor

Here's a handy utility that can be merged with your own programs to provide a professional and standard method of prompting for user data. The Screen Editor program allows the definition and editing of data fields that are input through the display screen. Screen design and the input and editing of data have always been the more difficult tasks facing the Basic programmer. With this program it's not only easier, but it's accomplished with the speed of assembly language programming.

The Screen Editor uses three types of fields for the purpose of data entry. Alphanumeric fields enter data from left to right and can offer field editing if desired. These fields are enclosed by square or angle brackets. When square brackets ([. . .]) are used, all characters from the keyboard are legal input except commas, slashes and dashes, which are passed over for easy editing by the Screen Editor program. When angle brackets (<. . .>) are used, any character may be input from the keyboard.

Numeric fields are entered from right to left and are displayed within parentheses. Commas and decimal points displayed as part of the field definition are passed over for easy editing by the Screen Editor.

The Screen Editor program adds a number of commands to the Basic command list, each starting with an ampersand (&):

&B—Display bottom program status line.
&C—Change screen colors.
&E—Enter data entry/edit mode (allows user to edit any field on screen).
&F—Edit a single field on the screen.
&K—Disable the Run/Stop key.
&L—Draw a horizontal line across the screen.
&S—Enable the Run/Stop key.
&T—Display the top program status line.

These commands provide a quick and simple interface with the assembly language Screen Editor program.

It's relatively easy to operate the Screen Editor. Type the data into the fields via the computer keyboard when prompted. Any typed character that does not comply with the rules of each particular field is ignored. The standard cursor control keys can also be used to position within fields, move from field to field and insert and delete characters.

Built-in Mode

The Screen Editor program has a built-in "control mode" routine. This routine can be modified to produce status codes on any key on the keyboard. The defined codes are limited to four. To use the control mode, press the control key. The program then displays "control mode" on the bottom program status line. Hitting one of the four defined function keys will cause the Screen Editor to return a status value in ST to the Basic program. The ST value gives the Basic program easy access to the status of the Screen Editor. To exit back into the main program, press the Commodore key.

The control mode has two preset options. These options are E and shift-Q. The E key exits from Basic and loads the first program found on the disk drive. A Run also is pushed into the keyboard buffer to assure the execution of the program. The shift-Q resets the C-64; it should be used with caution.

The Screen Editor stores the contents of the screen fields entered by the user in the string array SC$( ). This enables the Basic programmer to process the data returned from the screen editor. The programmer *must define* the array and fill it with spaces to match the field lengths prior to entering the data entry/edit mode. The first field on the screen is stored in array element zero, the second field in element one, and so on.

GradeCalc

Tamarack Software recently announced a grade and attendance management package designed to free teachers from many of the time-consuming

tasks of record keeping. Grade filing and reporting are set up in a flexible manner to accommodate any teacher's existing gradebook format.

With GradeCalc, the teacher has on file all the raw grades and assignment information. This file can average grades using a variety of methods, ranging from percentage scores to symbolic (letter) grades. In addition to averaging, a number of useful reports can be generated. The teacher can obtain a cumulative listing of missing assignments, grade totals, averages and grade book listings.

GradeCalc also maintains attendance records. The reports include cumulative totals of attendance figures and problem reports based on excessive absences or other problems.

The GradeCalc package is available on disk for the C-64 and the 40- and 80-column PET/CBM models, as well as for several other systems. List price for most versions is $29.95 retail.

For more information, see your local dealer or write Tamarack Software, Water Street, Darby, MT 59829.

Assembler Development System

The Commodore-64 Macro Assembler Development System is similar to the corresponding package for the PET/CBM systems. The software package allows you to program in native 6500 series assembly language code, directly on the C-64. It provides a powerful macro assembler, editor, two loaders and machine language monitors, along with other support routines. The package requires a Commodore disk, and you'll need a printer if you intend to do any serious assembly language programming.

This package contains everything you'll need to create, assemble, load and execute assembly language code. The package is directed toward the experienced computer user who has some familiarity with the 6500 series and with the operation of the C-64. It doesn't attempt to teach how to program in assembly language.

The editor is used to enter and modify source files for the assembler. It retains all of the features of the Basic screen editor and allows automatic line numbering, finding, changing, deleting within a range and renumbering. The source file can even be printed in a tabbed format similar to that produced by the assembler.

The assembler uses standard MOS technology mnemonics for the 56 instructions of the 6500 series processors instruction set. Each line of source code can contain an optional label, the instruction mnemonic and operand and comments. Full line comments are also allowed.

In addition, there are a number of assembler directives for reserving working storage, controlling the listing output, defining variables and the program counter, linking files and defining macros.

There are three output files generated by the assembler. Each file is optional and can be created through the use of one of the assembler directives. The listing file contains the program listing with errors and the symbol table. The error file contains all error lines and errors as included in the listing file. The interface file contains the object code as used by the loader program.

A cross reference file can be generated optionally by the assembler. This file is used to print a report showing all variables, their declared values and all line numbers in which each variable is used.

The interface file mentioned above does not contain true object code. The assembler produces portable output in an ASCII format that cannot be directly executed. This output must be loaded, using the loader programs provided, before the program can be executed.

The Assembler Development System is directed toward the experienced computer user who has some familiarity with the 6500 series and with the operation of the C-64.

Two versions of the loader are included on the development disk; each is positioned in a different area of RAM. This allows the user to load anywhere in RAM by using the correct loader. Hi-Load starts at location $C800, while Lo-Load starts at $0800. Both are about 512 bytes long.

Once you've assembled and loaded your assembly language program, you can test and debug your program with the help of two monitor programs. Again, two versions are included—one for low memory ($8000) and one for high memory ($C000). The monitor contains a mini-assembler, a disassembler and various commands to compare, fill, hunt, relocate/transfer, load/save and display/modify.

A copy of the DOS Wedge-64 program is included for added convenience. A special Boot All program will load and start the DOS Wedge, the Hi-Loader and the Editor, all at the same time.

These three programs reside in different areas in memory, allowing their use without having to reload before switching programs. The Assembler, however, uses the same area as the Editor, so source files can be lost if you forget to save them to disk before loading the Assembler.

Documentation with the package is excellent. The 60-page manual includes full instructions, C-64 memory maps, command summaries and file descriptions. As mentioned before, though, you should have a working knowledge of assembly language programming before attempting to use this package.

If you want to learn assembly language programming, there are a number of books currently available. Osborne/McGraw-Hill offers *6502 Assembly Language Subroutines* by Leventhal and Saville, as well as *6502 Assembly Language Programming* by Leventhal. Howard W. Sams has a book called *6502 Software Design* by Scanlon, and Sybex sells a book called *Programming the 6502* by Rodnay Zaks.

My personal choice would be the new release from Compute! Books—*Machine Language For Beginners*, written by Richard Mansfield.

Computer Marketing

Computer Marketing Services, Inc., is a marketing organization that distributes products exclusively for the Commodore line. Company president Dieter Ammann was director of application software for Commodore before he began CMS in 1981. Since its formation, the company has been constantly adding new products, including software and hardware items for every Commodore system.

VIC/64 Switch

The VIC/64 Switch allows you to set up a multi-user VIC-20 or C-64 system with up to eight systems communicating with the same disk drive and printer. The VIC/64 Switch connects to the disk drive via the serial bus DIN cable. Cables for connecting VICs and/or C-64s are available in lengths from three to 12 meters.

The VIC/64 Switch scans all of the connected systems for access to any peripheral unit. If more than one user wants to communicate at the same time, the Switch will put them in a queue in consecutive order. The search for another active user is restarted when the bus has not been in use for approximately a half-second.

The VIC/64 Switch retails for $149.95.

PET Switch

The PET Switch is a similar product that lets you set up a multi-user system with up to 15 Commodore 4000 or 8000 series computers.

The PET Switch mother unit connects to the disk drive with an IEEE/IEEE cable. The computers are then connected to the mother unit via daughter units that are available with cable lengths of 1.5 to 7.5 meters. Each daughter unit is plugged into the IEEE port of the corresponding

computer. The mother unit costs $275, while the daughter units range from $165 to $215.

Z-RAM

Madison Computer's Z-RAM board is a dynamic add-on board that allows you to run 96K programs on the Commodore PET/CBM systems; it provides CP/M capability as well.

The Z-RAM mounts inside the Commodore 4000 and 8000 series computers and adds a Z-80A microprocessor along with 64K of RAM. A serial port is also included, along with software to run printers with a standard RS-232 interface.

The board allows earlier versions of CBM computers to function as 32K machines regardless of original memory capacity. In memory expansion mode, 32 mappings are available; using blocks as small as 8K, 32K CBM machines are expanded to 96K useable RAM. Now you can run VisiCalc, WordPro-5+, UCSD Pascal, Wordcraft Ultra and a special version of Silicon Office.

The Z-80A and 6502 microprocessors run simultaneously at full speed. A copy of CP/M version 2.2 is also available as an option. This software emulates a Hazeltine 1500, which allows it to run most CP/M software. The standard 64K expansion board retails for $500, while the CP/M option brings the price to $695.

For more information on these and other Commodore products being distributed by Computer Marketing Services, Inc., see your local dealer or write the distributor at 300 W. Marlton Pike, Cherry Hill, NJ 08002.

VIC Banana Graphics Cartridge

In combination with the Gorilla Banana printer offered by Leading Edge Products' dealers, you can also obtain a graphics cartridge for the VIC-20 and a mating printer cable. With the special graphics cartridge, you can use the Banana printer exactly like Commodore/VIC printers. In fact, you get even more with the Banana printer and graphics cartridge combination.

Three Modes

There are three ways you can use the Banana printer with the graphics cartridge.

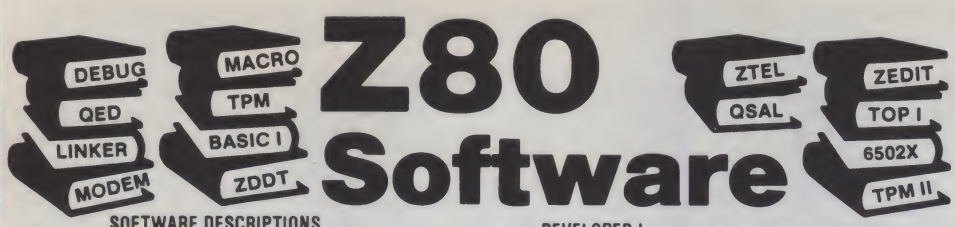
Emulation mode does just what you'd expect—it emulates the functions of the Commodore 1515 and 1525 printers. It enables you to print in either uppercase only or in upper/lowercase. In addition, it will print the built-in Commodore graphics symbols. On Commodore 1515 and 1525 printers, a number of special commands can be embedded within the printer data. The Emulate mode will duplicate all of these functions except one (inverse alphanumerics).

Total Text mode is similar to the emulation mode except that no Commodore graphics symbols are printed. One of two types of substitutions are made. If you're printing a listing, the cursor movement and color assignment symbols that appear within quotation marks in print statements are printed as a three-character mnemonic that describes the function. Thus, you might see <clr> instead of an inverse heart representing clear-home. This makes listings much easier to read— and you don't have to remember what the graphics symbols represent. All other graphics symbols are printed as numbers that represent the CHR$( ) value associated with that symbol.

Transparent mode prohibits any interpretation or translation of the data being sent to the printer. All data is passed along to the printer without intervention. Emulation and Total Text modes both interpret the information sent to the printer and make the necessary substitutions or conversions.

Each of the functional modes is entered by specifying an appropriate secondary address when opening a file to the printer. Each mode can be selected with or without automatic linefeed at the end of each line.

List price for the VIC Banana Graphics cartridge is $29.95. For more information, see your local dealer carrying Leading Edge Products.□



SOFTWARE DESCRIPTIONS

TPM (TPM I) - $80 A Z80 only operating system which is capable of running CP/M programs. Includes many features not found in CP/M such as independent disk directory partitioning for up to 255 user partitions, space, time and version commands, date and time, create FCB, chain program, direct disk I/O, abbreviated commands and more! Available for North Star (either single or double density), TRS—80 Model I (offset 4200H) or II, Versafloppy I, or Tarbell I.

TPM-II - $125 An expanded version of TPM which is fully CP/M 2.2 compatible but still retains the extra features our customers have come to depend on. This version is super FAST. Extended density capability allows over 600K per side on an 8" disk. Available preconfigured for Versafloppy II (8" or 5"), Epson QX-10, Osborne II or TRS-80 Model II.

CONFIGURATOR I

This package provides all the necessary programs for customizing TPM for a floppy controller which we do not support. We suggest ordering this on single density (8SD).
Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE ($FREE), MACRO II ($100), LINKER ($80), DEBUG I ($80), QED ($150), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$815 Value **NOW $250**

CONFIGURATOR II

Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE ($FREE), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QSAL ($200), QED ($150), ZTEL ($80), TOP II ($100), BUSINESS BASIC ($200) and MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1485 Value **NOW $400**

MODEL I PROGRAMMER

This package is only for the TRS-80 Model I. Note: These are the ONLY CDL programs available for the Model I. It includes: TPM I ($80), BUSINESS BASIC ($200), MACRO I ($80), DEBUG I ($80), ZDDT ($40), ZTEL ($80), TOP I ($80) and MODEM ($40)
$680 Value **NOW $175**

MODEL II PROGRAMMER

This package is only for the TRS-80 Model II. It includes: TPM-II ($125), BUSINESS BASIC ($200), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QED ($150), ZTEL ($80), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM ($40), MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1445 Value **NOW $375**

BASIC I - $50, a 12K+ basic interpreter with 7 digit precision

BASIC II - $100. A 12 digit precision version of Basic I

BUSINESS BASIC - $200. A full disk extended basic with random or sequential disk file handling and 12 digit precision (even for TRIG functions). Also includes PRIVACY command to protect source code, fixed and variable record lengths, simultaneous access to multiple disk files, global editing, and more!

ACCOUNTING PACKAGE - $300. Written in Business Basic. Includes General Ledger, Accounts Receivable/Payable, and Payroll. Set up for Hazeltine 1500 terminal. Minor modifications needed for other terminals. Provided in unprotected source form.

MACRO I - $80. A Z80/8080 assembler which uses CDL/TDL mnemonics. Handles MACROs and generates relocateable code. Includes 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical ops, local and global symbols, linkable module generation, and more!

MACRO II - $100. An improved version of Macro I with expanded linking capabilities and more listing options. Also internal code has been greatly improved for faster more reliable operation.

MACRO III - $150. An enchanced version of Macro II. Internal buffers have been increased to achieve a significant improvement in speed of assembly. Additional features include line numbers, cross reference, compressed PRN files, form feeds, page parity, additional pseudo-ops, internal setting of time and date, and expanded assembly-time data entry.

DEVELOPER I

Includes: MACRO I ($80), DEBUG I ($80), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$440 Value **NOW $150**

DEVELOPER II

Includes: MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), BUSINESS BASIC ($200), QED ($150), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM SOURCE ($40), ZTEL ($80), and DISASSEMBLER ($80).
$1280 Value **NOW $350**

DEVELOPER III

Includes: QSAL ($200), QED ($150), BUSINESS BASIC ($200), ZTEL ($80) and TOP II ($100)
$730 Value **NOW $300**

COMBO

Includes: DEVELOPER II ($1280), ACCOUNTING PACKAGE ($300), QSAL ($200) and 6502X ($150)
$1930 Value **NOW $500**

LINKER - $80. A linking loader for handling the linkable modules created by the above assemblers.

DEBUG I - $80. A tool for debugging Z80 or 8080 code. Disassembles to CDL/TDL mnemonics compatible with above assemblers. Traces code even through ROM. Commands include Calculate, Display, Examine, Fill, Goto, List, Mode, Open File, Put, Set Wait, Trace, and Search.

DEBUG II - $100. A superset of Debug I. Adds Instruction Interpreter, Radix change, Set Trap/Conditional display, Trace options, and Zap FCB.

6502X - $150. A 6502 cross assembler. Runs on the Z80 but assembles 6502 instructions into 6502 object code! Similar features as our Macro assemblers.

QSAL - $200. A SUPER FAST Z80 assembler. Up to 10 times faster than conventional assemblers. Directly generates code into memory in one pass but also to offset for execution in its own memory space. Pascal like structures: repeat...until, if...then...else, while...do, begin...end, case of. Multiple statements per line, special register handling expressions, long symbol names, auto and modular assembly, and more! This one uses ZILOG Mnemonics.

QED - $150. A screen editor which is both FAST and easy to learn. Commands include block delete, copy, and move to a named file or within text, repeat previous command, change, locate, find at start of line, and numerous cursor and window movement functions. Works with any CRT having clear screen, addressable cursor, clear to end of line, clear to end of screen, and 80X24.

ZTEL - $80. An extensive text editing language and editor modelled after DEC's TECO.

ZEDIT - $50. A mini text editor. Character/line oriented. Works well with hardcopy terminals and is easy to use. Includes macro command capability.

TOP I - $80. A Text Output Processor for formatting manuals, documents, etc. Interprets commands which are entered into the text by an editor. Commands include justify, page number, heading, subheading, centering, and more.

TOP II - $100. A superset of TOP I. Adds: embedded control characters in the file, page at a time printing, selected portion printing, include/merge files, form feed/CRLF option for paging, instant start up, and final page ejection.

ZDDT - $40. This is the disk version of our famous Zapple monitor. It will also load hex and relocatable files.

ZAPPLE SOURCE - $80. This is the source to the SMB ROM version of our famous Zapple monitor. It can be used to create your own custom version or as an example of the features of our assemblers. Must be assembled using one of our assemblers.

MODEM - A communication program for file transfer between systems or using a system as a terminal. Based on the user group version but modified to work with our SMB board or TRS-80 Models I or II. You must specify which version you want.

MODEM SOURCE - $40. For making your own custom version. Requires one of our Macro Assemblers.

DISASSEMBLER - $80. Does bulk disassembly of object files creating source files which can be assembled by one of our assemblers.

HARDWARE

S-100 — SMB II Bare Board $50. "System Monitor Board" for S-100 systems. 2 serial ports, 2 parallel ports, cassette interface, 4K memory (ROM, 2708 EPROM, 2114 RAM), and power on jump. When used with Zapple ROM below, it makes putting a S-100 system together a snap.
Zapple ROM $35. Properly initializes SMB I/II hardware, provides a powerful debug monitor.

IBM PC — Big Blue Z80 board $595. Add Z80 capability to your IBM Personal Computer. Runs CP/M programs but does not require CP/M or TPM. Complete with Z80 CPU, 64K add on memory, serial port, parallel port, time and date clock with battery backup, hard disk interface, and software to attach to PC DOS and transfer programs. Mfr'd by QCS.
50% Discount on all CDL software ordered at the same time as a Big Blue (and for the Big Blue).

APPLE II — Chairman Z80 $345. Add Z80 capability to your Apple II/II Plus computer. Runs CP/M programs with our more powerful TPM. Includes 64K memory add on (unlike the competition this is also useable by the 6502/DOS as well as the Z80). TPM, QSAL assembler, QED Screen Editor, and Business Basic. Mfr'd by AMT Research.
Apple Special $175. Buy the Apple Z80 Developer at the same time as the "Chairman" and pay only $175 instead of $325.

APPLE Z80 DEVELOPER

Includes: 6502X ($150), MACRO II ($100), MACRO III ($150), QSAL ($200), QED ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), ZDDT ($40) and BUSINESS BASIC ($200)
VALUE: $1250 **NOW $325**
$175 when purchased with AMT "Chairman" Board

DISK FORMATS

When ordering software specify which disk format you would like.

CODE	DESCRIPTION
8SD	8" IBM 3740 Single Density (128 bytes/26 sectors/77 tracks)
8DD	8" Double Density (256 bytes/26 sectors/77 tracks)
8XD	8" CDL Extended Density (1024 bytes/8 sector/77 traceks 616K)
5SD	5.25" Single Density (TRS80 Model I, Versafloppy I, Tarbell I)
5EP	5.25" Epson Double Density
5PC	5.25" IBM PC Double Density
5XE	5.25" Xerox 820 Single Density
5OS	5.25" Osborne Single Density
5ZA	5.25" Z80 Apple (Softcard compatible)

TPM INFO When ordering TPM I or II, in addition to Disk Format, please specify one of the following codes

	CODE	DESCRIPTION
TPM I:	NSSD/H	North Star Single Density for Horizon I/O
	NSSD/Z	North Star Single Density for Zapple I/O
	NSDD/H	North Star Double Density for Horizon I/O
	NSDD/Z	North Star Double Density for Zapple I/O
	TRS80-I	TRS-80 Model I (4200H Offset)
	TRS80II	TRS-80 Model II
	VI8	Versafloppy I 8"
	VI5	Versafloppy I 5.25"
TPM-II:	VII8	Versafloppy II 8" (XD)
	VII5	Versafloppy II 5.25"
	TRS80II	TRS-80 Model II (XD)

ORDERING INFORMATION:

VISA/MasterCard/C.O.D.
Call or Write With Ordering Information....

OEMS:

Many CDL products are available for licensing to OEM's. Write to Carl Galletti with your requirements.

Dealer Inquiries Invited.

For Phone Orders ONLY Call Toll Free...

1-(800) 458-3491 (Except Pa.)

Ask For Extension #15

For information and Tech Queries call
(609) 599-2146

Prices and Specifications subject to change without notice.
TPM, Z80, CP/M, TRS80 are trademarks of CDL, Zilog, DRI and Tandy respectively

Computer Design Labs

342 Columbus Avenue/Trenton, NJ 08629

Circle 18 on Reader Service card.

LETTERS TO THE EDITOR

Are Computers Funny?

I am putting together an anthology. I would welcome contributions of computer-related humor. The ordinary man's disquiet about computers has sometimes been expressed in contrived jokes that bring the resented superiority of the expert down to earth. How are jokes changing with the spread of personal computers?

I welcome anecdotes, biographical notes, witty accounts, cartoons, parodies, verse, self-deception and hoaxes. Especially sought are items that, while humorous, also provide insight into changing attitudes or illuminate personalities. Sources of contributions must be fully identified.

Robert L. Weber
104 Davey Laboratory
University Park, PA 16802

Will *Microcomputing* Run From Commodore?

The entire staff of *Microcomputing* is to be congratulated for the quality magazine that it puts out. I subscribe to it for $80 per year (I live in Tegucigalpa, Honduras, Central America) because it gives good, general coverage on a variety of systems, and it isn't 60 percent advertisements.

I hear that you're coming out with a VIC-20/C-64 magazine this fall. I hope that won't result in an absence of VIC-20/C-64 articles from the pages of *Microcomputing*.

Tom Pruett
Tegucigalpa, Honduras

Thanks for the kind words.

Yes, Tom, Wayne Green, Inc., will be publishing a Commodore magazine. It will be called RUN *and should premiere in November. However, you'll still be able to find a slew of Commodore articles, as well as our monthly Commodore column, in the pages of* Microcomputing.

Editors

Readers Unite

As a newcomer to computing, I have been reading *Microcomputing* regularly and I would like to be put in touch with other readers who have similar interests or problems and would be willing to assist me.

I have acquired a previously owned Zenith-89 with three disk drives (5¼-inch single-sided, single-density hard sector) with CP/M.

My special interests/problems are:

- Basic-E: This is a public-domain compiler and interpreter that I have recently obtained. The documentation that I have is sketchy, so I need to locate a Basic-E user's manual or other documentation for Basic-E that will allow me to understand the use of this language.
- Cobol: I am a neophyte Cobol programmer and I would like to communicate with someone who has implemented Cobol on a microcomputer, particularly the Z-89.
- IDS-460 Printer: I would like to hear from someone who is using or has used this particular printer. I am especially interested in learning how to utilize the graphics capability of the IDS-460.

Any assistance your readers can give me would be greatly appreciated.

William F. Fowler
4014 Hillwood Court
Beltsville, MD 20705

What Do You Do With Your Portable?

I am writing a book about portable and briefcase-size computers and hope that your readers can help me. I'd like to hear from owners of portables about how they use them, how they like them and what advice they'd give to potential buyers.

I'm particularly interested in stories about occasions when a portable computer proved to be particularly useful—or useless. Humorous anecdotes would be particularly valuable.

Robert A. Deckert
PO Box 267
Palm City, FL 33490

Make That $180

Thank you for mentioning our program in your August issue. We especially liked the sample printout on page 13 (Fig. 2).

We would like to bring your attention, though, to the section headed The "Big Blue" Black Book on page 14. Beside our program name you listed the price as being $80 instead of $180. We haved received calls from people who have read that section and they are disappointed to find the price, although quite reasonable, is $100 more than they expected.

Themis Darre
Soft Craft
Los Angeles, CA

Looking for a List

My work frequently involves comparison of various hardware combinations and the software available to perform specific tasks. I am finding with disturbing frequency that there is apparently no method of finding and evaluating all relevant application software packages developed to run under a given vendor's operating system. I would like to have access to a list of those application packages, utilities, support tools, menu drivers. . . that are available for and compatible with a given operating system on given hardware. To date I have not found such a list.

Is anyone aware of any service or company that provides lists of software available by vendor or by operating system? Any assistance would be appreciated.

Timothy V. Hibbs
9900 Osuna Road, NE
Albuquerque, NM 87111

Pen Pals Wanted

I own a Timex-Sinclair computer and I would like to communicate in writing with other owners.

Chris Elsasser
Box 635 Rt. 2
Camilla, GA 31730

Dying to Diet

I'm trying to find information on a computerized scale for dieticians.

When a foodstuff is placed on the scale, you type in the name of the food. The CRT then shows a complete listing of the foodstuff values, such as calories, amount of proteins, fat and carbohydrates. Other things listed include the total sodium, potassium and other items contained in the food.

Do any of your readers have information on the name of the computer, the manufacturer and the address?

Donald W. Koza, M.D.
1171 E. Idaho Ave.
St. Paul, MN 55106

CP/M for the 80s

The Lobo MAX-80 offers you TRS-80 compatibility and the CP/M operating system. The system sells for $820, and no matter how you compute value, it's worth the price.

By Frank J. Derfler, Jr.

Finally—a CP/M operating system that TRS-80 owners can get into.

The Lobo MAX-80 (from Lobo Systems, Inc., 358 S. Fairview Ave., Goleta, CA 93117; 800-235-1245) is capable of running the large library of software designed for TRS-80 models I and III. By spending $69 for the optional LDOS operating system (which is often used to replace the standard TRS DOS operating system on Radio Shack products), MAX-80 owners will be able to run most programs written for the TRS-80. And the MAX-80 will generate all of the same graphics as the TRS-80; it'll even operate in the enlarged character mode.

An excellent selection of software is available for the TRS-80, and if you've already made an investment in this area, the Lobo provides you with a way to bridge the gap between TRS DOS and CP/M. You can use your old programs and files under LDOS and still use software from the huge number of available CP/M programs to perform other functions.

The MAX-80's ability to run TRS-80 software isn't the only feature that makes it so valuable. Its flexibility does, too.

The Lobo MAX-80 system features attractive design, excellent flexibility and low price. Pictured here are the Lobo MAX-80 computer, Amdek monitor, dual 5¼-inch disk drive unit and 8.3-megabyte hard disk with 1155K floppy disk.

Flexibility

Some excellent microcomputer systems in the sub-$2000 range are available, but most give up one major feature to stay at that price range: flexibility. The Osborne, Kaypro and Morrow Micro Decision have no real expansion capabilities, aside from their built-in serial and parallel ports. They are integrated units with no flexibility in hardware configuration. The MAX-80 is designed to change and grow.

Lobo Systems began in business by marketing disk drives. This lineage shows up in the MAX-80's ability to use a large variety of disk drives simultaneously—with no change in the disk controller hardware. The MAX-80 has interfaces built in for both 5¼-inch and eight-inch disk drives. The controller is capable of reading and writing in single- and double-sided and single- or double-density disk formats.

The system reads and writes the IBM standard 3740 single-density eight-inch disks commonly used for CP/M machines, and it reads and

Contact the author at PO Box 691, Herndon, VA 22070.

writes the Osborne, Xerox and Omicron 5¼-inch disk formats. So you can exchange data and text files with many CP/M machines simply by swapping disks. As a result, the MAX-80 makes an excellent translation machine for moving files between different formats quickly and easily.

The Lobo system will handle both new and old technology. Lobo makes hard disk drives for the MAX-80, so if you have a lot of data, you can plug its five- or 8.5-megabyte hard disk and controller into the system. If you have disk drives left from an older TRS-80 or an S-100 bus system, the Lobo MAX-80 can probably be used with them, too.

Pricing

Lobo's pricing scheme contributes to its flexibility. The basic computer is contained in an attractive cabinet that houses the keyboard, CPU, 64K of RAM and all interfaces. The CPU is a Z-80 running at the unusually high speed of 5 MHz. In addition to the disk controller, the interfaces included in the system are two RS-232C serial ports, a parallel printer port and an expansion bus port.

The basic machine includes a video generator that needs only a monitor to provide a full 80-character-per-line monochrome display. It can reproduce the same graphics set as the TRS-80 Model I or III. This basic system costs $820 and represents a remarkable value at that price.

The other pieces of the MAX-80 come in separate stand-alone units that are flexible and attractive. A 5¼-inch disk drive system with two single-sided, 40-track drives (180K per disk) is $690. If you want four times the storage at only twice the price, you can get two double-sided, 80-track drives (720K per disk) for $1175.

Two eight-inch drives able to handle 577K per disk sell for $1185. But, in another smart marketing move, Lobo offers you twice the storage for only a 25 percent increase in price. You can get two double-sided, double-density, eight-inch drives with 1155K per disk storage for $1485.

The Winchester technology hard disk systems come in various combinations with and without floppy disk drives. The five-megabyte disk starts at $2100. You can do the math to figure out which alternative gives you the most bytes per buck, but the point is that Lobo has a system for nearly every need—plus the ability to grow to meet new needs.

RAM On—To 128K

Lobo has put another feature on the MAX-80 to give you even more to think about. For $95, a second 64K block of RAM is included; it can be used as a RAM disk or as part of a bank-switching system. Bank-switching gives the CPU the ability to move quickly between different 32K blocks of memory while executing a program. This is much faster than reading the data in and out of memory as it is needed.

> The Lobo was designed for flexibility and expansion. It can be configured as a machine for a computer hobbyist, or it can be used to handle large chores. . .

A RAM disk uses extra RAM memory to store data exactly like a disk does. The operating system thinks a RAM disk is a fast mechanical device. A RAM disk is many times faster than a typical floppy disk and at least twice as fast as a hard disk. However, you must use caution with a RAM disk, because if the power goes off or if the system resets, you'll lose everything in RAM. Frequent saves are a must when you use a RAM disk system.

The bank-switching software was not available for the Lobo at the time I wrote this review, but the RAM disk worked well. It's addressed as disk 1 (you can have A-H as various mechanical drives). The 5 MHz speed of the CPU enhances the operation of the RAM disk and makes it the disk of choice if the files you're using will fit into 64K.

I wish Lobo would figure out a way to squeeze yet another row of 64K chips into the MAX-80 so the RAM disk could use 128K. If it did, I could keep both a large program with overlays (like WordStar) and a large text file in the RAM disk. This would eliminate the need to use the slower mechanical disk drives, except during saves and start-up.

The Lobo was designed for flexibility and expansion. It can be configured as a machine for a computer hobbyist, or it can be used to handle large accounting and inventory chores for serious business applications. At both extremes and all points in the middle, it offers an excellent cost/capability ratio.

Performance

I like the design, performance and ease of use of the MAX-80. The disk drive cabinet is square and boxy, but it's well-proportioned. The computer/keyboard system is attractive and has some nice design features.

The keyboard has an appealing touch, and the arrangement of the keys is excellent. The return and shift keys are extra large, the arrow and control keys are easy to use and the number pad has a separate enter key.

I appreciate the fact that the colon is

The rear view of the Lobo MAX-80 shows its capability for expansion. The standard system can provide two serial ports, a parallel printer port, separate ports for 5¼-inch, eight-inch and Winchester hard disk drives, and an expansion bus similar to the bus on the Radio Shack TRS-80 Model I. The only drawback to this extensive capability is that it can lead to a clutter of cables that spoil the otherwise clean design of the system.

a lowercase character. You need this so frequently with CP/M that shifting can become a real nuisance. The system reset key is easy to reach, but it is not likely to be activated accidentally.

"El lobo" is Spanish for "the wolf," and the Lobo logo is a baying wolf. The eye of the wolf on the MAX-80 lights up when the power is on. That doesn't help to move the 0s and 1s, but it does add appeal.

The $175 monitor sold with the Lobo system is made by Amdek. Its green screen offers impressive resolution.

A Capsule Look At the Lobo MAX-80

Manufacturer
Lobo Systems, 358 S. Fairview, Goleta, CA 93117.

List Price
$820

Standard features
Z-80B CPU; 80×24 screen format; 640×225 graphics resolution; SASI interface; two RS-232C serial ports; Centronics-type parallel printer port; expansion bus; 64K RAM, expandable to 128K; 5¼-inch disk size.

Popular Options
LDOS operating system; hard disk drive; monitor.

Proportions
Nineteen pounds; 3½ × 17½ × 10 inches.

Operating System
CP/M 2.2.

Documentation
Operating manuals and technical documentation.

Lobo did a good job of integrating the CP/M operating system into its computer. Easy-to-use set-up, disk-formatting and communications utilities are provided.

The documentation I received with the Lobo was marked "preliminary," but it was useful just the same. I was particularly impressed because the machine came with technical data sheets on the disk drives and input/output ports. Everyone may not need this kind of information, but I like getting schematic and pictorial diagrams.

The MAX-80 manual even has exploded-view drawings that make it easy to see relationships of subsystems, as well as locations of the major components.

The language used in the MAX-80 manual is clear and friendly, and the instructions are complete without being overly technical.

Since this is supposed to be a critical review, I should comment on two discrepancies. One should be corrected, but the other is built into the design.

First, when you're entering commands in CP/M, there is no way to erase an improper entry. Neither the delete key nor the back-arrow key work at this level. That should be fixed.

Second, because the MAX-80 has so many I/O functions built into its keyboard system, the back of this otherwise attractive unit can become a mass of round and flat cables. I can't think of an easy way to change this—it comes with the design—but by the time you add all of the disk, RS-232C, printer and power cables, the system loses some of its appeal.

Marketing

Lobo has made two important marketing decisions on the MAX-80.

First, the only way it's being sold is directly by Lobo through phone or mail order. You can't run down to the local computer store to see one. Second, the price of the MAX-80 doesn't include piles of software.

> Whether you use a spreadsheet or a dart board to make decisions, the Lobo MAX-80 should be in your field of contenders.

Lobo Systems has been in the business of direct selling for several years. It maintains toll-free telephone numbers for sales and service, and it provides help both in configuring your system and operating it when you get it set up. Obviously, direct marketing reduces the number of people making a profit on each system and allows Lobo to charge the end user less. You have to decide if you can get along with help over the phone or if you need to have your hand held more closely.

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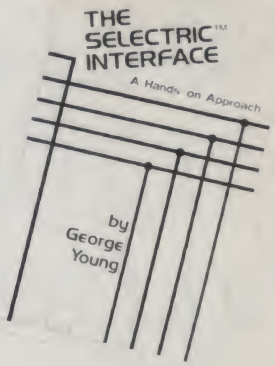

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Hexing Your Timex-Sinclair

If you want to program animated graphics on your TS-1000 or ZX-81, machine code is the only way to go. But using that tiny keyboard for decimal entry can be a disaster. In this article, **Microcomputing** *author Jim Stephens describes how to program in hexadecimal.*

By Jim Stephens

If you've tried some neat, fast-moving, animated graphics on the Sinclair ZX-81 (and TS-1000) using Basic, you know there has to be a better way. That way is called machine code.

The use of machine code is the only reasonable method for handling animated graphics for a smooth and flicker-free display on the ZX-81.

Once you decide to use machine code, however, you'll find several built-in problems associated with this type of programming. ZX-81 designers left out a machine code monitor; ZX-81 Basic accepts only cumbersome decimal numbers, and using the tiny original keyboard for decimal entry can be slow and highly mistake-prone.

I've found that the most efficient form of machine code entry is hexadecimal, which probably is a result of using it extensively in the past. The major manuals on the Z-80 instruction set seem to prefer it also. The use of hex will save about a third of the keystrokes required when entering decimal. The listings of hex code will appear more readable because each instruction is only two digits in length.

```
10 REM "THIS IS A 60 CHARACTER SPACE THAT STARTS
       WITH ADDRESS 4082"
20 PRINT "ENTER STARTING ADDRESS IN HEX"
25 INPUT A$
30 LET C=0
35 PRINT A$
40 LET X = 4096 * CODE A$ + 256 * CODE A$(2) + 16 *
         CODE A$(3) + CODE A$(4) -122332
50 PRINT "ENTER HEX INSTRUCTION"
55 INPUT I$
60 IF I$="" THEN GOTO 180
65 IF I$ = "." THEN GOTO 120
70 LET C = C + 1
80 IF C >8 THEN GOTO 150
85 PRINT I$; " ";
90 LET Y = 16 * CODE I$ + CODE I$(2) -476
100 POKE X,Y
105 LET X = X + 1
110 GOTO 55
120 CLS
130 PRINT "ENTER LOCATION TO BE CORRECTED OR
         LOCATION TO CONTINUE LOADING"
140 GOTO 20
150 PRINT " "
160 LET C = 1
170 GOTO 85
180 STOP
```

Listing 1. Hexadecimal loader.

Address	Object Code	Source Code	Comments
4082	16	LD D,n	set space
4083	0A		counter
4084	21	LD HL,nn	set display
4085	9F		file address
4086	42		
4087	36	LD(HL),n	load display
4088	80		with char.
4089	23	INC HL	
408A	15	DEC D	if not finished
408B	20	JR NZ,	print another
408C	FA		char.
408D	C9	RET	return to basic

Listing 2. Simple print to screen loop.

Programming in Hexadecimal

Since ZX-81 Basic accepts only decimal numbers, some conversion is going to be necessary before sending hex code through Basic to memory. Listing 1 will accept the two-digit hex instructions and poke them into the proper memory location. Lines 20–40 will assign the starting address, and since mistakes can occur, an input of a decimal point will give you the opportunity to return to an address that needs correcting. Line 10 is a REM statement of 60 spaces for holding your machine code routine; this area can be as long or as short as you wish.

The placement of machine code within a REM statement has the advantage of being safe from over-writing; also, it won't move around in memory as the Basic lines are added, and it can be listed.

The address at the start of this space is 4082 hex, or 16514 decimal. It's important to remember never to use the instruction HALT (76h) in your code because all loading, saving and listing of the program will automatically stop when a halt instruction is evaluated. A null string will stop the loading.

To execute the code you have entered, simply run the Basic line LET N=USR 16514. This can be done either from a direct command or from

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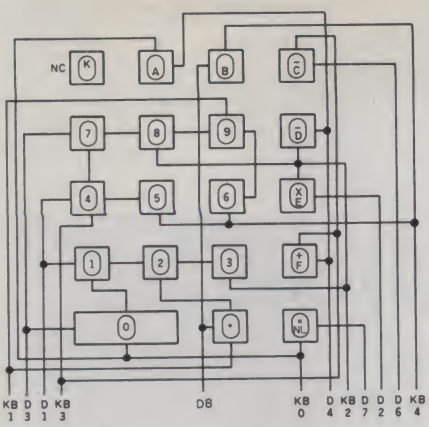

NOTE: VERTICAL LINES CONNECT TO CENTER PIN ON EACH KEY AND HORIZONTAL LINES CONNECT TO OUTSIDE PINS.

Fig. 1. Calculator keyboard matrix connections.

within a basic program using a numbered line. A short machine code routine is provided in Listing 2, a simple print loop that demonstrates the speed at which machine code executes. Remember always to end your code with the return instruction (C9h) to get back to Basic, or the program will either crash or end up in an endless loop.

If you plan to use hexadecimal machine code extensively in your programming, you'll want a hexpad. This unique little keyboard can have everything you need for fast, efficient hex entry and can double as a numeric keypad for those income tax and budget programs.

Converting Calculator Keypads

You can purchase commercial hexpads from various sources, but the cost is high. Surplus calculator keypads can be obtained and converted for a fraction of what the hexapads would cost.

The only requirement is that the keypads have the extra memory function keys. These memory keys will become the hex characters A–F, and the "=" key will serve as the enter key. The decimal point key should be left as is for use when the keypad is used for decimal entry. The memory keys can be painted over and dry transfer letters applied for the A–F characters. The new letters can then be sprayed with clear lacquer to protect them from wear.

Connection to the ZX-81

To connect the surplus keypad to the ZX-81, remove the keypad from its enclosure and cut all common foil connections to each key. This may require that the keypad be disassembled, since most are copper-plated on each side. Then "daisy-chain wire" each set of keys, as shown by the wiring matrix in Fig. 1. These lines should be extended by a ten-inch ribbon cable connected to a 15-pin connector, as shown in Fig. 2.

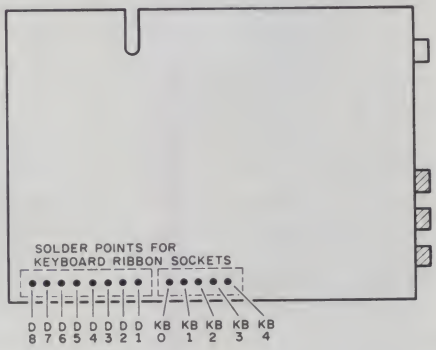

Fig. 2. Cable connector.

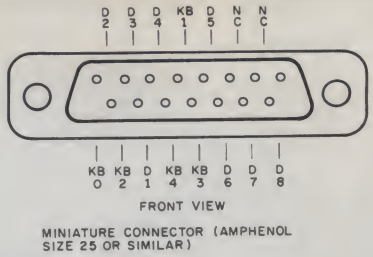

Fig. 3. Solder side of ZX-81 printed circuit board.

Remove the bottom of the ZX-81 case and solder a short length of ribbon cable to the original keyboard socket connections, as in Fig. 3. This cable should be no longer than five inches, and it should be terminated by a matching connector to the new keypad. Use as little heat and solder as possible on the keyboard sockets, and guard against static discharge. Static could permanently injure your little micro. However, the ZX-81 is durable and forgiving if care is used.

Machine code programming is difficult and is recommended only for those with a great amount of patience. The addition of this little hexpad will take some of the misery away, since the difficulty of entering will be eased considerably.

You'll find that you can learn machine code programming quickly—and your new hexpad may give you that little extra incentive you need.■

Apple Goes to School

The author describes how he used his microcomputer to model a school's energy-management performance.

By Stephen L. Canipe

I bought my Apple II microcomputer for pleasure and as a learning tool for my daughter. Little did I realize that I'd be using it to help get my doctor's degree from Duke University, but that's what happened. In my research work I was able to combine my avocation, working with computers, with my vocation, which is working for an electric utility.

Handling Repetitive Calculations

During my work for a doctorate in school administration, I had several courses in building design and in energy management. Doing the energy calculations in these courses by hand (using the American Society for Heating, Refrigerating and Air-Conditioning Engineers [ASHRAE] book) made me realize that the formulae used were repetitive. And what is better than a computer for handling repetitive calculations?

So I proceeded to explore the idea of utilizing a microcomputer in my research, which was to develop a practical way of allowing school administrators to model a building's energy performance.

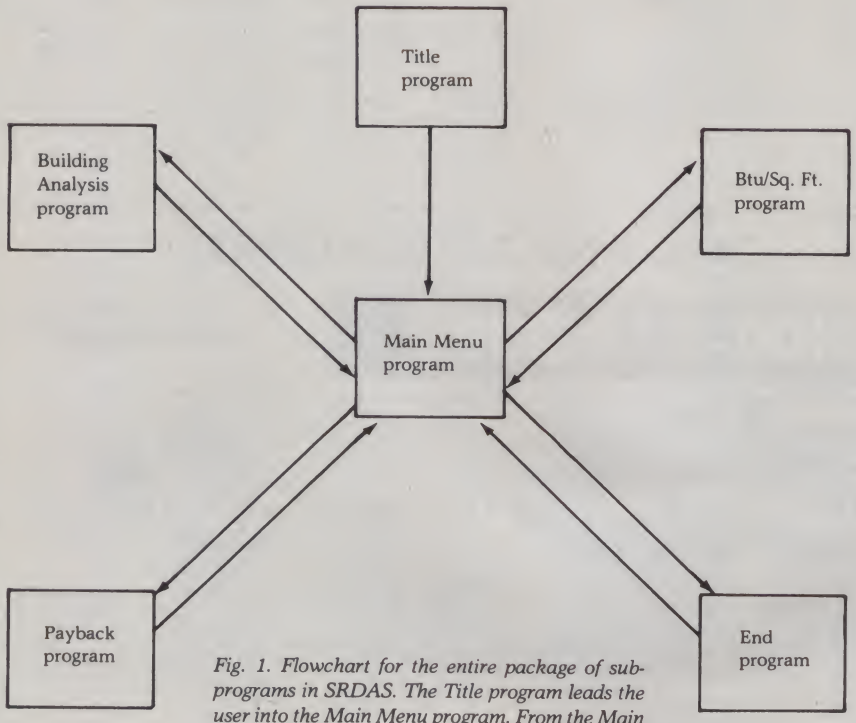

Fig. 1. Flowchart for the entire package of subprograms in SRDAS. The Title program leads the user into the Main Menu program. From the Main Menu any of the four alternatives can be selected.

Engineers have little or no trouble understanding what is in the *ASHRAE Fundamentals Handbook*. Unfortunately, most people in the educational community have no engineering training, so they can't possibly understand the ASHRAE handbook. Most school administrators don't even know it exists. My task was to help school administrators and board members understand the energy consequences of various actions they might take in upgrading existing buildings or designing new school facilities.

My dissertation research was not designed to provide a total engineering analysis, but to enable an administrator to make a few measurements and come up with some potential cost-saving energy conservation actions. Reductions in energy and costs would form the basis of all evaluations within the program, which I called School Retrofit Design Analysis System (SRDAS).

Making it Foolproof

The first problems were in making the program as foolproof as possible and to reduce the number of entries the user would have to make. I accomplished this ease of operation through menus, with the user required only to press 1, 2, 3, 4, etc., in accordance with the get command from Applesoft Basic. Where the user has to enter numbers—as for the roof or window area—a statement is provided explaining the proper way to

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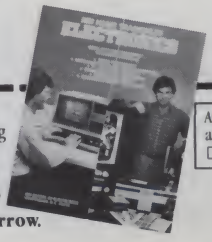

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The SRDAS program is comprised of three major subprograms (Fig. 1): the Building Analysis program, the Btu/Sq. Ft. program and the Payback program.

Building Analysis allows the user to conduct a modeling exercise for energy upgrades to roof, walls, windows, floors and infiltration sites in the building. This analysis makes use of numerous subroutines, and the user can conduct several different model runs without returning to the initial subprogram menu.

> Administrators will find the preliminary analysis made possible through SRDAS and a microcomputer both time and dollar saving.

The use of a data sheet (Fig. 2) allows a record to be kept of the various scenarios. Each of the analyses within the Building Analysis subprogram outputs the saving in Btu's per hour. These results are summed on the data sheet as well as within the program, and a final figure is presented to the user when the option "end" is selected from the menu.

When the Building Analysis subprogram has been ended, the user returns to the primary menu for SRDAS. At this point, he may select either of the other two programs or end the modeling session completely. If he selects

DATA SHEET
Building Analysis

1. Roof loss ______ Insulation savings ______
   a. type — built-up ______
      pitched ______
   b. type insulation (pitched) ______
   c. dimensions (pitched) ______
   d. dimensions (flat) ______
   e. suspended ceiling (Y/N) ______
   f. R-value of installed or proposed addition ______

2. Floor loss ______ Insulation savings ______
   a. slab-on-grade ______
   b. crawl space ______
      - dimensions ______
      - R-value of installed or proposed addition ______

3. Infiltration loss ______ Insulation savings ______
   a. type wall (brick, wood) ______
   b. wall area ______
   c. type window fit (loose, weatherstripped) ______
   d. perimeter measure of windows ______
   e. window caulking and condition ______

4. Wall loss ______ Insulation savings ______
   a. wall area minus window area ______
   b. R-value of proposed or installed addition ______

5. Window loss ______ Solar heat gain ______ Insulation savings ______
   a. glass area facing: N ______ S ______ E ______ W ______
      NE ______ SE ______ NW ______ SW ______
   b. type window: single glazed ______
      double glazed ______
      storm window ______

6. Total Btu saved ______

(Fill in the lettered blanks before running the Building Analysis program.)

Fig. 2. Building analysis data sheet for recording British thermal units per hour in various scenarios.

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Btu/Sq. Ft., this subprogram is loaded into memory, erasing all of the previously stored variables.

Subroutines within the Btu/Sq. Ft. subprogram allow the user to determine how many Btu's per square foot are being consumed, as well as the total administrative, operation and maintenance costs per student for a particular class. It thus allows a check on electric utility bills.

Premodeling Preparation

This subprogram is useful to an administrator in determining both the current state of affairs with respect to costs and a projection of future costs, should proposed energy-saving measures be taken. A data sheet (Fig. 3) for this section allows the user to prepare information prior to the modeling session.

When the option "end" is selected from the Btu subprogram menu, the user returns to the primary menu, whence he may select the last subprogram within SRDAS or quit the modeling session. If Payback is selected, the program presents a series of questions asking for current energy costs for various fuels. A data sheet (Fig. 4), filled out prior to beginning the program, will enable easy data entry at this point.

Additional questions concerning the energy source for the Btu savings are asked. By a simple entry process, the user indicates the energy sources used or considered in the building analysis. Questions concerning interest rates and life of the proposed addition also are asked, so that analyses can be performed using life-cycle costs.

Contemplating Energy Savings

Once the three subprograms have been completed, the program ends and the user is left to contemplate the energy savings determined through SRDAS. In a time of ever-tightening budgets, school administrators will find the preliminary analysis made possible through SRDAS and a microcomputer to be a saving both in time and in dollars.

To conduct an energy analysis, an

DATA SHEET
Btu/Sq. Ft.

1. Percent instructional use space _____
   a. total square feet _____
   b. area devoted to instruction _____
2. Daily student costs _____ Professional _____ Nonprofessional _____
   a. central administrative costs _____
   b. total number of teachers _____
   c. number of teachers in school _____
   d. school service costs _____
   e. average teacher cost salary _____
   f. number of periods teacher teaches _____
   g. number of students in class _____
   h. transportation costs _____
   i. total number of students in system _____
   j. maintenance and operation costs _____
   k. number of students in school _____
   l. percent of instructional use space (see #1 above) _____
3. Energy costs (electric) _____
   a. enter up-to-date kwh costs in lines 3700-3900 (base is Duke Power Co. as of 1 Aug. 1982)
   b. kwh used _____
   c. billing demand (kw) _____
4. Btu-sq. ft. _____ Percent of national goal _____
   (average monthly use of:)
   a. electricity (kwh) _____
   b. natural gas (ccf) _____
   c. oil (gallons) _____
   d. coal (tons) _____
   e. LP gas (gallons) _____

(Fill in the lettered blanks before running the Btu/Sq. Ft. program.)

Fig. 3. SRDA program's data sheet for recording British thermal units per square foot.

engineering firm may charge several thousand dollars. Utilization of SRDAS can perform—for an investment of less than $20—a preliminary analysis to determine whether or not a proposed modification is feasible. (While the program model was developed on an Apple II Plus, it had been converted to run also on the IBM Personal Computer.)■

DATA SHEET
Payback

1. Dollar savings _____

   a. cost — electricity (kwh) _____ oil (gal) _____
   — natural gas (ccf) _____ coal (ton) _____
   — LP gas (gal) _____

   b. Btu saved — electricity _____ oil _____
   — natural gas _____ coal _____
   — LP gas _____

2. Debt service constant _____

   a. interest rate _____
   b. number of years of useful life _____

3. Amortization costs for added materials _____

   a. difference in capital costs _____

4. Annual O & M savings _____ Benefit/cost ratio _____

   a. yearly O & M for system A _____
   b. yearly O & M for system B _____

5. Payback time for investment _____

6. Present worth of savings _____

7. Fuel savings with rising costs _____

   a. annual fuel costs system A _____
   b. annual fuel costs system B _____

8. Total savings over payback _____

(Fill in the lettered blanks before running the Payback program.)

Fig. 4. Payback data sheet enables easy data entry of current energy costs.

Give Your VIC Some Character

Do you fancy some new characters for your VIC-20? If so, the answer may lie with this easy-to-use character design program.

By R.V. Taylor

Have you ever thought about programming some of your own characters on your VIC-20? Well, here's a simple program that lets you do just that—quickly, easily and with precision.

Step-by-Step Instructions

When you run the program, the first screen you see will be the menu, which has four listings:

A. Design Character
B. Select Character to be Changed
C. Program New Set
D. Restore Programmed Mode

The next step is to choose one of these items from the menu. Since you have not yet designed a new character, or set of characters, you should select item C—Program New Set.

It is important that you use this item first, at the beginning of a new set of characters. It sets up a transfer of character memory from the ROM to the RAM, where you can use it.

Immediately the screen changes and displays "Transferring Memory." This will stay on the screen for a few seconds, and then the menu will reappear. You have just transferred 64 characters from the ROM to the RAM for your use.

Your next step is to design the character that you want, so press A—Design Character.

The screen changes again. In the upper left-hand corner you will see a matrix of 64 circles—eight rows of eight. Below this matrix are more instructions. The first instruction will read: "Design Character by Typing (black ball) onto Matrix."

The circles that appear in the matrix are the same circles that you can make on your keyboard by holding down the shift key and typing W. The black ball is made by holding down the shift key and typing Q. To design your character by typing the black ball over the circles in the desired places, simply move the cursor to the location that you want.

After you have completed designing your character, run the cursor below the word "Ready." Follow the second instruction, which reads: "Then type CONT and Press RETURN."

The screen changes again. The matrix, which contains your newly designed character, stays intact, but a column of figures—one for each row of the matrix—appears at the immediate right of this matrix. These numbers are the codes for your data in creating your new character.

Now follow the instruction immediately below: "Type In Data On Line 770. Enter Line. Then RUN 600."

To do this, move the cursor up to the line that reads: "770 DATA." Then move the cursor to the immediate right of the word "DATA." Type the top number of the column of numbers above, followed by a comma. Then type the next number, comma and so on until all of the numbers have been

Program Listing. Program to design characters on your unexpanded VIC-20.

```
100 REM***************
110 REM* SETUP FOR  *
120 REM*PROGRAMMABLE*
130 REM* CHARACTERS *
140 REM*    BY      *
150 REM*R.V. TAYLOR *
160 REM***************
170 GOTO200
180 PRINT"■■■■■■■■■■■■ TRANSFERRING MEMORY"
190 FORI=7168TO7679:POKEI,PEEK(I+25600):NEXT
200 POKE36879,221
210 PRINT"■■  PROGRAM CHARACTERS  ■"
220 PRINT"          MENU"
230 PRINT"          ————"
240 PRINT"■■ A. DESIGN CHARACTER"
250 PRINT"■■ B. SELECT CHARACTER       TO BE CHANGED
260 PRINT"■■ C. PROGRAM NEW SET
270 PRINT"■■ D. RESTORE PROGRAMMED     MODE
280 GETG$:IFG$=""THEN280
```

More

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typed in on line 770. Do not place a comma after the last (eighth) number.

Now press the return key, type RUN600 and hit the return key again.

Again the menu comes on the screen. This time select item B—Select Character to be Changed.

Another screen change occurs. At the top of the screen the words "Input Character to be Changed" appear, followed by a question mark and a blinking cursor. Now decide which character on your keyboard you want to become the new character you have just designed. Let's say that you have chosen the letter P. If so, type the letter P and press the return key.

(Once) you have
the mechanics behind you,
use your creativity
to think up
some fancy characters.

Now the screen shows your new character in the upper left-hand corner. Near it is a number, which represents the starting position of this new character in the screen memory. It is merely for information and has nothing to do with the execution of the program.

Now type the letter P. You will notice that each time you type it, your new character will appear in its place. Try typing some of the other characters on the board, and you will see that they have not been affected.

That's All There Is

To return to the program to design additional new characters, press the run/stop key and the restore key. The screen will be cleared. Now run the program again to return to the menu. This time do not press item C—Program New Set. If you do, you will erase your new character. To design additional new characters, press A and continue as before.

You press item D—Restore Programmed Mode—when you leave the program for some reason and wish to return to your programmed characters.

That's it. Now that you have the mechanics behind you, use your creativity to think up some fancy characters.■

Listing continued.

```
290 IFG$="A"THEN340
300 IFG$="B"THEN610
310 IFG$="C"THEN180
320 IFG$="D"THEN800
330 END
340 PRINT"■"
350 FORL=0TO7:FORM=0TO7
360 PRINTSPC(L)"O"
370 NEXT:PRINT"■":NEXT
380 PRINT"■■■■■■■■"
390 PRINT"■■  DESIGN CHARACTER BY TYPING ● ONTO MATRIX."
400 PRINT"■  THEN TYPE ■CONT■ AND  PRESS ■RETURN■"
410 END
420 Y=128
430 FORJ=1TO8
440 FORI=7680+22*JTO7680+7+22*J
450 IFPEEK(I)=81THENX=X+Y
460 IFPEEK(I)=87THENX=X
470 Y=Y/2
480 NEXT
490 Y=128
500 PRINT"■"
510 PRINTTAB(22*J-22)"■■■■■■■■■■"X;
520 X=0
530 NEXTJ
540 PRINT"■■■■■■■■■■■■"
550 FORI=1TO22*9:PRINT" ";:NEXT
560 PRINT"■■■■■■■■■■■■"
570 PRINT"  TYPE IN DATA ON LINE770.  ENTER LINE.";
571 PRINT"  THEN RUN 600."
580 PRINT"770 DATA"
590 END
600 GOTO200
610 REM**************
620 REM*SELECT CHAR *
630 REM* TO CHANGE  *
640 REM* ROUTINE    *
650 REM**************
660 PRINT"■INPUT CHARACTER TO BE CHANGED"
670 INPUTA$
680 PRINT"■■"A$
690 DC=PEEK(7680)
700 SL=7168+8*DC
710 PRINTSL
720 REM**************
730 REM* PROGRAM    *
740 REM* CHARACTER  *
750 REM**************
760 FORI=SLTOSL+7:READA:POKEI,A:NEXT
780 POKE36869,255
790 END
800 PRINT"■":POKE36869,255
```

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2764	68766		12816A	8742
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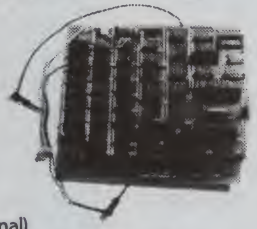

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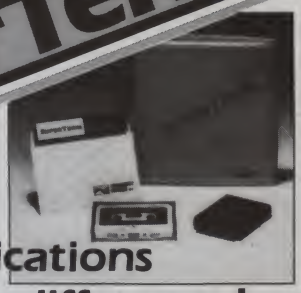

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A New Generation

The H120 represents Heath's third generation of microcomputers. From the H8 to the H89 to its new 100 series, Heath has changed with the times. In this first of a two-part article, Martin Moore describes how to assemble the H120.

By Martin Moore

If you stop and think about it, personal computers are three generations old.

The first-generation machines were those built for hobbyists. They used a nonstandard bus structure (there weren't any standards in those days); they were generally limited to 8K (any more was too expensive); and *serious* computer people thought they were toys.

The second generation turned a few heads. What's this? Up to 64K? A real termimal? Honest-to-goodness computing power? The change was remarkable.

Personal computers started to achieve a degree of respectability, particularly when Radio Shack announced that it was going to build and sell computers. At about the same time, a couple of mavericks decided to start a company called Apple (Apple?).

The personal computer business began to get serious. Computers were being designed in garages and basements. Software started pouring out of the woodwork, and small business firms began thinking about cutting off that expensive time-sharing computer. Those who watched the industry stood back and said, "What's next?"

What came next were 16-bit microprocessors, high memory, a wide variety of enhancements—and the big boys, DEC and IBM.

Tracing Heath's History

One way to look at the three generations of personal computers is to look at the products offered by the Heath Company.

Heath's first computing product was the H8. The H8 was an 8080-based computer that originally came without memory (8K cards were extra). The computer was booted up through switches on the machine's front panel. The H8 didn't have a standard bus (although the S-50 bus was gaining in popularity) and its operating system was Heath's own—definitely a first-generation computer.

The second generation was reflected by the H89 personal computer. The machine was Z-80-based, held up to 48K of RAM (16K standard), had a single 5¼-inch disk drive standard, a decent keyboard and a built-in 80-character by 24-line CRT. Although Heath initially offered only its HDOS operating system, it bowed to public pressure and added the CP/M operating system soon after introduction.

In 1982, Heath anounced its entry into the third-generation race: the H100 series. The H100s contain dual processors (an 8088 and an 8085); extraordinary amounts of memory (up to 756K); medium-resolution graphics; double-density, double-sided 5¼-inch disk drives; and your choice of two operating systems (MS DOS or

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CP/M). It even has an S-100 bus for accessory circuit boards.

Over the years, Heath's computer line has exemplified each stage of the personal computer industry.

This is the first of a two-part article describing one such third-generation machine—the Heath H120. This month we'll look at putting the kit together. Next month we'll describe what you've got once you've built the H120.

What You Get . . .

If you order a Heathkit H120, what you'll get on your doorstep are three large boxes and one smaller box. The large boxes contain the computer hardware and manuals. The smaller box contains the CRT.

I'm always a little nervous when I open the CRT box, because it seems to be the most fragile of all computer components. I've had two shipped to me, however, and both have arrived safely.

A feeling of *deja vu* came over me when I looked at the packing slip. When I ordered an H89 several years ago, everything was shipped except the disk drive controller, which was delayed by a month. The same thing happened with the H120's disk drive controller. Everything but the controller was shipped on April 21, with controller shipment promised by May 6.

As instructed on the outside of each carton, I unpacked the "Open Me First" box, got out the assembly manual and then proceeded to check each component for shipping damage.

These are the parts that come in the kit:

- Main circuit board—preassembled and tested.
- Color video processor circuit board—preassembled and tested.
- Switching regulator power supply—preassembled and tested.
- Video driver circuit board—kit.
- Disk drive controller circuit board—kit.
- Tandon disk drive.
- 12-inch CRT.
- Cabinet parts—including a steel base and back panel, and structural foam shell.
- Various hardware components—nuts, bolts and screws.

As you can see from the list, only two circuit boards have to be assembled. Everything else is preassembled and tested by Heath.

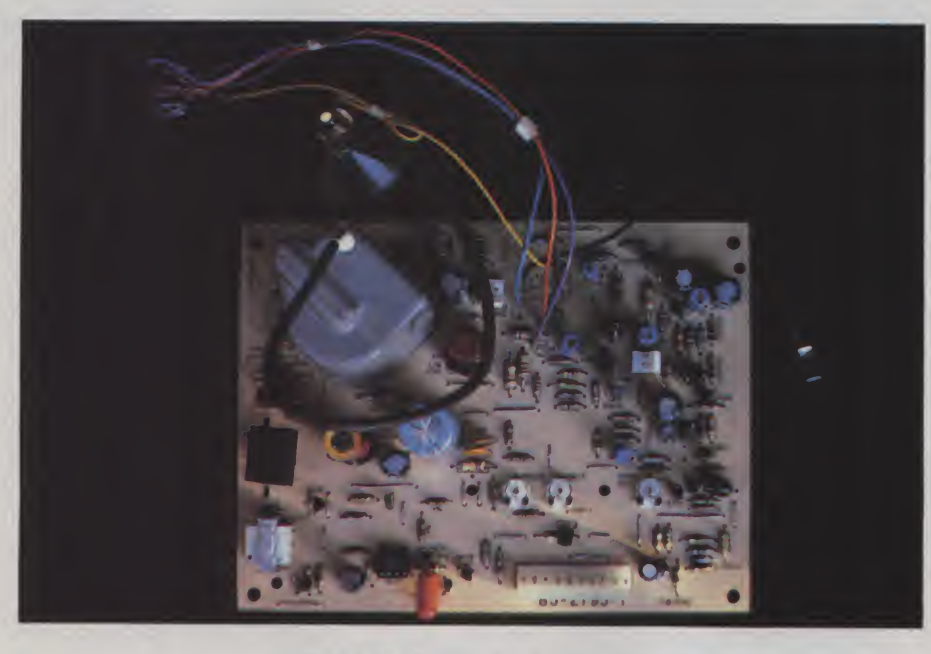

Photo 1. The H120's video driver board.

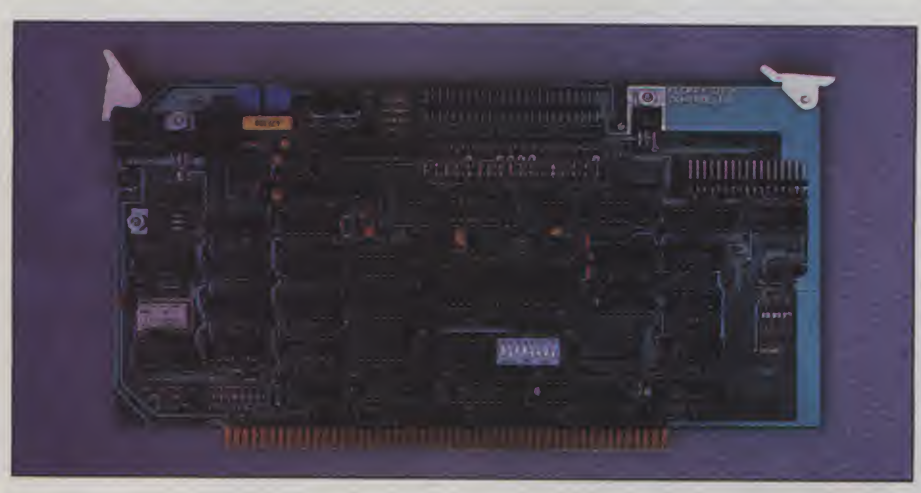

Photo 2. The disk drive controller board.

Getting Started

If you're going to be a good kit builder, you'll have to do what Heath recommends—read the manual first. That's the easiest way to become familiar with the various parts you'll have to assemble.

It almost goes without saying that Heath delivers the finest assembly manuals available. They've been in the kit business for over 50 years, and they know how to help you be successful.

Assembling the Video Drive Board

The first task in building the H120 is assembling the video driver board shown in Photo 1. This is a high-quality etched circuit board that's used to drive the CRT. There are no static-sensitive components on the video driver, so you needn't worry about working in a static-free environment. You can put it together anywhere that you don't have to worry about burn marks from a soldering iron.

The video driver board is made up almost entirely of transistors, resistors and diodes, with a single integrated circuit to be installed. If you've handled a soldering iron before, you can put this board together in about five hours. If you haven't, give yourself an extra hour or two for learning time.

One of the complaints I had when assembling the H89 was that Heath threw all the diodes in one sack and made me use a magnifying glass to identify the part numbers.

Well, they've fixed that problem. Almost all the components, aside from resistors, are bagged separately, so you can identify them quickly. Even the precision resistors are in a separate bag, so you don't mix them up with

the five percent parts.

By the way, those precision resistors were the only things that gave me trouble. In the assembly manual, when a precision resistor was called for, they identified the part in a special manner—except toward the end of the procedure when they just called out a 100 ohm resistor.

At first, I thought I didn't have enough parts to go around. Finally I figured out that they didn't actually mean any old 100 ohm resistor. They meant a precision 100 ohm resistor.

The Disk Drive Controller

The disk drive controller board (shown in Photo 2) handles communications between the computer board and the disk drive. When completed, the controller plugs into the S-100 card cage, leaving four empty slots for further expansion.

The controller board, unlike the video driver board, is a double-sided circuit board. The board was apparently designed on a CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) system, because the space between the circuit runs is small.

CAD/CAM systems generally allow circuit board designers and manufacturers to place a lot more circuitry on a board than with the old hand-designed methods. The tight tolerances mean something to the kit builder. They mean that it's easy to create solder bridges (a link of solder between two circuit points that aren't supposed to be connected).

Another drawback to the kit builder is the fact that circuit runs are a lot narrower; therefore, they're easier to pull up when too much heat is applied. Make sure you use nothing larger than a 15-watt pencil iron when soldering on a board like this.

Components on the controller board are made up almost entirely of integrated circuits and capacitors, and they're fairly easy to install. There are a few coils used in the circuitry and they can cause some problems.

Each coil is made up of a few turns of varnished wire wrapped around a ferrite bead. If, when installing the coils, you set them right down on the circuit board, a varnished portion of the lead can get down into the hole. Solder won't stick to a varnished surface. So if you're not careful, you'll wind up with a cold solder joint (one that won't conduct signals).

There are three static-sensitive ICs used in the controller circuitry. Heath ships them to you in conductive foam pads. When you handle the parts, follow Heath's directions to the letter to make sure that you don't blow the parts with static electricity.

It took me about six hours to assemble the disk drive controller board. Once the board is assembled, you have to build a small test board that you'll use later to calibrate the circuitry. When that's done (about ten minutes), you set it all aside until you've got the rest of the computer put together.

Bolting It Together

When you've assembled the video driver and disk drive controller boards, you're ready to start mounting the circuit boards and other hardware in the card cage. Well, almost ready.

The power supply used in the H120 is a switching regulator power supply. Switching regulators are, by their very nature, electrically noisy things. That's the price you pay for light weight and efficiency. The power supply that I got needed a slight modification. The power leads that went to the disk drives were apparently noisy, and Heath included a procedure to add two ferrite beads to each set of leads to quiet them down.

If you don't already know what ferrite beads look like, you'll have trouble finding them in the kit. They weren't identified. In my kit, the beads were included with a small sack of odds and ends in a small box inside the big box that contained the shell. Once found, the beads took about ten minutes to install.

When you've got the power supply modified, you're ready to start assembling the computer. The base of the H120 is steel, to provide strength and to help block EMI (electromagnetic interference)—the radiation that causes a black line to run up and down on your TV when your computer's on.

Onto this base goes the main circuit board. The H120 is, for all intents and purposes, a single-board computer. The main board contains the 8088 and 8085 processors, 128K, I/O ports and the S-100 expansion slots. The main board is large (about 12 by 18 inches), and comes packed in a conductive plastic wrapper inside a foam-protected box all its own. The circuit board mounts solidly onto the metal base.

Once the main board is mounted, you place the color video processor circuit board on top of the main board. The color video processor board processes only color video if you've bought the color option (extra RAM,

ROM and a color CRT). The board also processes the black-and-white images if you haven't bought the color option.

The metal back panel goes on next. The back panel has 12 cutouts for D-type connectors of various sizes, as well as the brightness control and an RGB (red-green-blue) output to connect to a separate color monitor. Heath has also included a built-in lightpen connector for future use.

When the two circuit boards are mounted and the back panel is in, you begin cabling. Another difference between the H89 kit and the H120 kit is how much effort you have to put into building cables. When assembling the H89, I probably put six hours into building the interconnect cables and suffered severely burnt fingers. Fortunately, Heath fixed that problem. The H120 kit doesn't require you to build any cables at all. Everything is done for you.

The main circuit board and color video processor board are connected with two ribbon cables that are easily installed. The power supply goes in next. The power supply, again because it's a noisy switching regulator, is housed entirely in a metal box. They've even stuck the cooling fan inside the power supply housing. Therefore, all you have to do is mount the power supply box in next to the circuit boards. It's a tight fit.

At this point, you've got the base completed, as shown in Photo 3.

The keyboard sits on two foam strips. Then a lower housing fits down over the circuit boards and keyboard, and screws into place.

The CRT (either green, black-and-white or color) and the disk drive are mounted on the front bezel of the H120 which, in turn, fits onto a second housing (Photo 4). When the second housing is in place and screwed down tight, all that's left is the cover.

Assembly Summary

That, in a nutshell, is the assembly process. Total time to assemble the kit ran to about 12 hours.

There are some things about assembling the H120 that I didn't like. Whenever one piece of structural foam attaches to another or to the metal base, you're required to screw them together with hex-head screws. The trouble is, the holes in the foam aren't prethreaded, and it's difficult to get the screws in.

At several points, I was applying so much torque to the screw that I thought I'd break the foam. Structural foam is tough stuff, but not unbreakable. I'd suggest that Heath either use metal inserts like they did with the H89, or pretap the foam at the factory.

Another problem is with the hex-head screws themselves. Like most hex-head screws used in assembling electronic equipment, the things are hard to get hold of. Screwdrivers slip, and the head itself isn't tall enough to accept a socket or nut driver very well.

But, structural foam aside, the quality of a Heathkit is in seeing if it works the first time. After running some preliminary resistance checks, I turned the H120 on. I heard a beep followed by some static crackling, and there was the raster with the little hand pointing to the right, just like in the manual! Few things are as satisfying as knowing you did it right the first time. Or at least thinking you did it right the first time. Little did I know that trouble loomed on the horizon.

Time for Calibration

There are two circuits that you must calibrate before using the H120: the video driver and the disk drive controller.

The video driver calibration is straightforward. You simply adjust the controls to create a symmetrical image that's centered on the CRT.

The drive controller calibration is a little tougher. In fact, the procedure that Heath recommends can convince you that you've made a mistake in assembling the controller board.

Controlling the Calibration Crisis

The root of the calibration problem is the fact that the disk drive controller is able to store data on a double-density disk. When you begin packing data tightly on a disk, you need what's called "precompensation" circuitry. Precompensation allows the controller to write data to the inner-most track of the disk without getting severe data compression. Part of the precompensation circuitry is a voltage-controlled oscillator that's supposed to create a 4 MHz square wave.

Heath's calibration procedure asks you to put a volt meter on the voltage input of the oscillator. Theoretically, if you set the input voltage to + 1.4 V dc, you'll get 4 MHz. To be fair, Heath does warn you that the procedure is difficult and can be messed up. The procedure asks you to strap some points on the circuit board, then adjust a bias control. Then you add another temporary strap and adjust the frequency potentiometer until you get a reading of + 1.4 V dc, which supposedly causes the oscillator to output 4 MHz. I did that, but the drive didn't

Photo 3. The base of the H120.

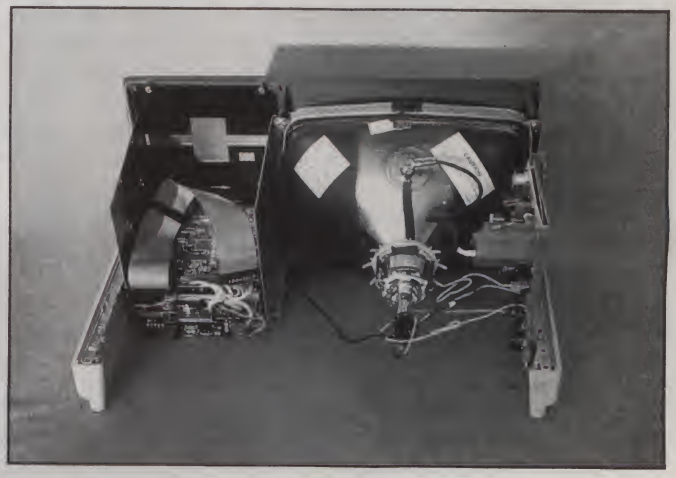

Photo 4. The H120's second housing holds the CRT.

work. When I tried to boot the Heath demonstration disk, I got an error message that said I had a device failure. So, back through the calibration procedure. It didn't work again.

Thinking that I had messed something up when building the circuit board, I pulled the controller and looked for bent IC pins or solder bridges. The board was clean.

My frustration was just about peaking when I looked at the schematic for the controller board. I decided that what I needed to do was measure the frequency output of the oscillator to make sure that it was generating 4 MHz.

I borrowed a frequency meter from a friend, and put it on the output of the oscillator. Three MHz! I double-checked the input voltage. It was +1.4 V dc. It should have been right, but it wasn't.

I decided to see whether I could tune the oscillator to give me the 4 MHz regardless of the input voltage. So, watching the frequency meter, I adjusted the potentiometer until the meter said 4 MHz. Then I went back and checked the input voltage. It again showed +1.4 V dc!

It turns out that the oscillator can be set to either 3 MHz or 4 MHz, and in each case the input voltage will be +1.4 V dc.

Heath has a philosophy (and generally a good one) of not requiring any equipment more sophisticated than a volt/ohm meter to assemble its kits. In this case, however, I would argue with them. I think the only reasonable way to set the precompensation oscillator is with a frequency meter or oscilloscope. I'm afraid Heath will get a lot of telephone calls on this one asking why the disk drive doesn't work.

Once the oscillator was properly adjusted, though, the demonstration disk booted with no problem.

Remember the calibration circuit board that had to be built? Once you've got the controller precompensation circuitry generally working, you have to do some fine tuning. The calibration circuit board connects to drive controller. Then you're required to boot the system with either Z-DOS or CP/M, and then to initialize a blank disk.

During the initialization process, you adjust another potentiometer to fine-tune the circuit. This procedure was no problem. You simply adjust the potentiometer until a little light on the calibration board turns from a blinking to a steady state.

It's All Over

With the disk drive controller board calibrated, the H120 was done. Total time, including the time wasted with the controller board calibration procedure, was about 14 hours. I would estimate that the assembly time could be cut by nearly seven hours if Heath would preassemble and test the controller board. But, that's why you get the price discount on kits. It's *your* time spent, not Heath's.

The first thing I did when the computer was completed was run the demonstration disk. What a pleasure to watch the H120 go through its paces. The computer is fast and the graphics are impressive (see photos). The H120 is definitely a third-generation computer.

In the next part of this article, I'll describe what you get when you buy an H120—and it's pretty impressive.■

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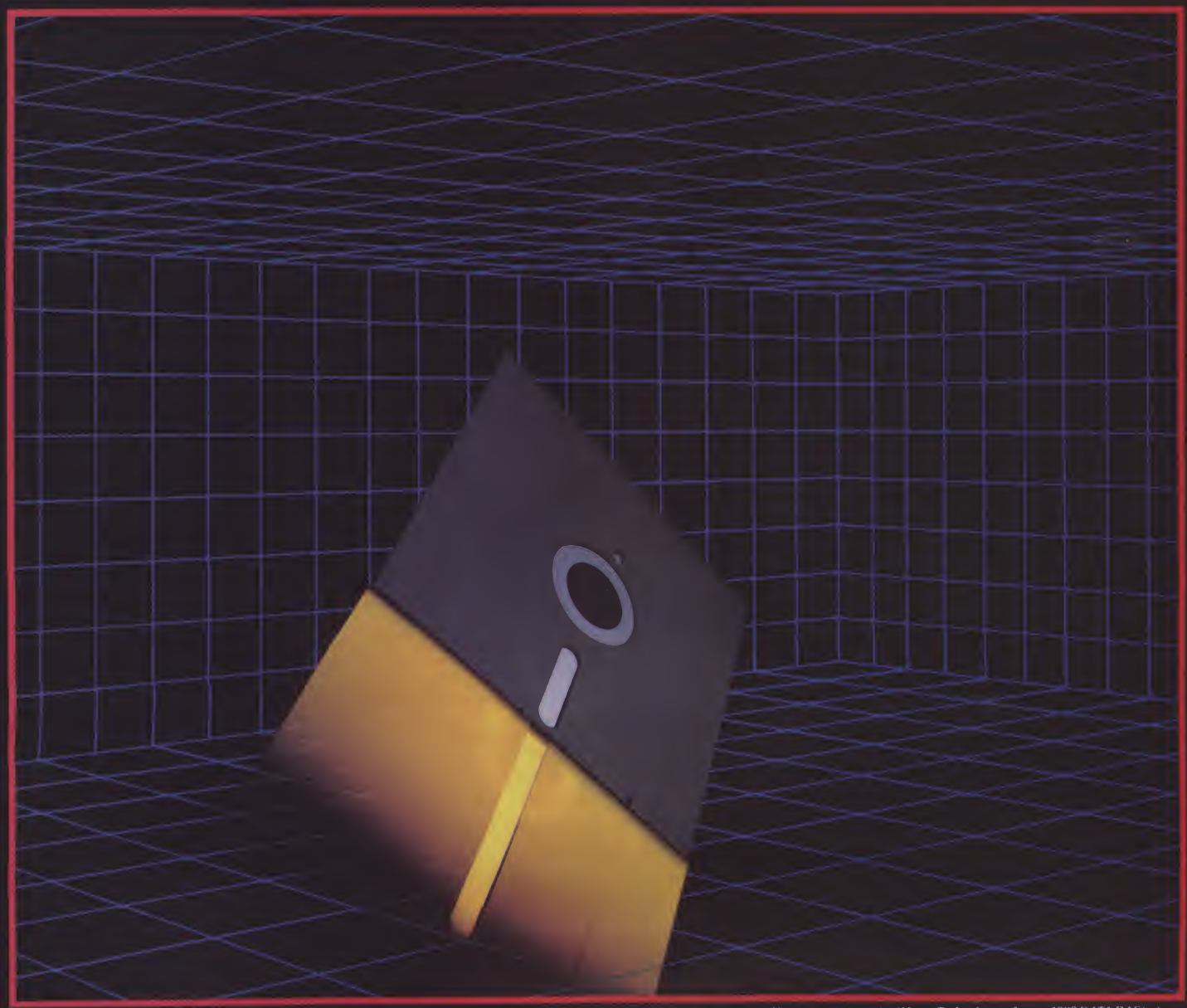

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Let's Interface It . . .

After borrowing an Epson MX-80, the author set out to interface that printer with his VIC-20. This article outlines the problems he had—as well as his solutions.

By Tom Pruett

After purchasing a VIC-20 computer, my first project was to borrow the Epson MX-80 printer from my brother's computer (an OSI C1P) and interface it with the VIC. Armed with little more than the VIC manual and my back issues of *Microcomputing*'s "PET-pourri," I assembled the interface shown in Fig. 1.

Hardware

The printer was equipped with a serial RS-232 interface set to operate at 1200 baud. The only handshaking is a busy signal sent on the RS-232 Data Terminal Ready (DTR) line. On the C1P, we simply connected this line to the computer's Clear To Send (CTS) line, so I did the same in this interface.

One correction to the VIC manual involves a description of the user I/O port. Pins 10 and 11 are said to be 9 V and GND, respectively. These pins are actually connected to both sides of the power transformer, which is connected internally in a full-wave bridge circuit, so no negative voltage is available here. This is the reason for the extra diode (D3) and capacitor (C1) in the negative supply of Fig. 2.

To convert TTL signals to RS-232 and vice versa, I chose to use two Motorola integrated circuits that were de-

```
10 REM RS232 2.2
100 FORX=0TO62
110 POKE7528+X,PEEK(62074+X):NEXT
200 FORX=7591TO7679
210 READD:POKEX,D
220 NEXTX
300 FORX=51TO55STEP2
310 POKEX,104
320 POKEX+1,29
330 NEXTX
400 POKE806,104
410 POKE807,29
1000 DATA120,134,151,132,158,44,16,145,80,251
1010 DATA104,133,182,173,28,145,9,192,41,223
1020 DATA141,28,145,32,232,29,162,8,70,182
1030 DATA144,4,9,32,176,2,41,223,141,28
1040 DATA145,32,247,29,202,208,237,9,32,141
1050 DATA28,145,32,247,29,32,247,29,166,151
1060 DATA164,158,24,88,96,160,79,140,20,145
1070 DATA160,3,140,21,145,160,64,140,30,145
1080 DATA44,29,145,80,251,44,20,145,96
READY.
```

Listing 1. Program that replaces the defective routine with one stored at the top of RAM.

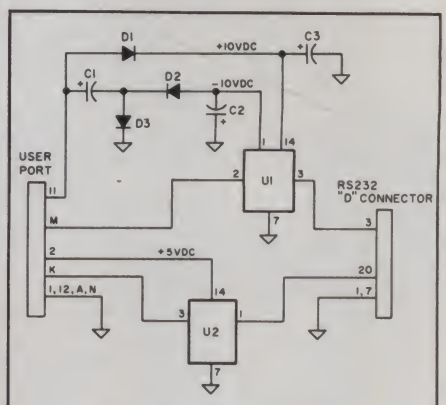

Fig. 1. VIC-20 RS-232 interface.

Parts List

U1:	MC1488
U2:	MC1489
D1-D3:	IN4001
C1-C3:	100 µfd 35 V electrolytic

Fig. 2. Parts for interface in Fig. 1.

Address correspondence to Tom Pruett, Apartado 145-C, Tegucigalpa, Honduras, Central America.

signed for this purpose. Each chip contains four separate level translators, of which only one each is used. Some may call this overkill, but if you ever want to implement some of the other RS-232 lines, perhaps for use with a modem, you can do so easily.

Problems

My first attempts at listing to the printer were quite disappointing. I don't think it printed one character correctly, and after a while, the computer would lock up completely.

After some head-scratching, I observed that the CTS line seemed to have no control over the output of data. I wrote a small program using the Basic Wait statement, which would wait for the CTS line to go high before it would try to output, and it almost worked. But you can't list a program from inside a program. I had to find the real problem.

In Search Of . . .

I spent many hours disassembling machine code with a program written in Basic, and after a couple of weeks, I found what I believe is the problem.

The VIC contains two parallel interface chips. One is addressed at $9110 and is the user port and joystick interface. The other is addressed at $9120 and is dedicated to the keyboard and serial I/O bus.

Beginning at memory location $EFA3 is the routine that prepares data to be sent out the user port. At $EFF1 is the section that checks the handshaking lines. $EFF5 is the instruction that should read the user port at $9110, but instead it reads the keyboard interface chip at $9120. It's looking for the handshaking lines in the wrong place! Check this for yourself by typing PRINT PEEK(61429). The answer should be 16, but it's 32.

Solutions

I called my dealer about this, and he told me that Commodore probably wasn't even aware of this bug. Maybe it is now, and will get around to fixing the bug sometime soon. But in the meantime, I would like to be able to produce hard copy.

I tried writing programs that would copy the defective routine into RAM and correct the error there. The problem with this is that you also have to copy every routine that branches to or calls the defective routine. I was copying about 500 bytes of code before I decided that there must be a better way.

What I ended up with is the program in Listing 1, which, by the way, was made by my VIC and Epson running this program.

Lines 100 and 110 copy 63 bytes of the "Output to Device" routine from ROM and lines 200–220 follow it with an 89-byte serial output routine read from the data statements. Lines 300–330 reset the top of memory and string pointers to protect our new routine from Basic. Lines 400 and 410 change the output vector to point to our routine.

I wish this
article didn't have
to be written.

After you have typed in the program, saved it and run it, type NEW. You can now program as you wish; our routine is still there, safe at the top of memory. To use it, open the RS-232 channel with OPEN X,2,1, where X is your logical file number. After that, all your PRINT#X commands will be sent to the RS-232 port.

Be careful; if you hit the run/stop and restore keys; you'll go back to the original output routine. Retype the contents of lines 400 and 410 to reset the output vector, only type them as *one* line or you'll have problems.

This routine does not use an output buffer, so printing does slow everything down. The data format is: one start bit, eight data bits, no parity, two stop bits and 1200 baud; the handshaking line is active with a high at the user-port pin.

For those of you with more than 8K of RAM, you'll have to relocate the routine to the top of your memory.

Thoughts

I should point out that if handshaking is not needed, the original output routine works fine. Just specify the "3 line" interface when you open the channel.

I wish this article didn't have to be written, but maybe what I've found will help others who are having similar problems.■

Disk User or Disk Duffer?

With the aid of this two-part article (the first half appeared in* Microcomputing *last month), even a novice programmer can pick up random access disk file basics. The instructions presented here make random access file I/O incredibly easy.

By Dan Bishop

In the first half of this two-part article (*Microcomputing*, September 1983, p. 80), we looked at how even a novice Basic programmer could set up effective random access disk files by using a predefined set of instructions and data statements. Each subrecord transferred from the disk was transferred as a complete string, FR$(F), from file F, and the individual data within that string had to be extracted using the MID$ function.

Similarly, before saving a string to disk, the subrecord string had to be built up, again using the MID$ function, by loading it with each data element. If several disk files are to be used by a program, a good deal of bookkeeping will be required just to be sure the right variables are loaded into the proper places within the subrecord string.

Take Another Step

This article goes one step further and describes an instruction set that forces the computer to keep track of all the MID$ manipulations. These instructions, along with those presented in the previous article, promise to make random access file I/O so simple that even the family pet may want to try it.

As before, the programmer uses the handler instruction set just as it is presented within this article, and uses data statements to give the computer the information it needs for the disk routines.

There are two further advantages to using the full set of random access handler instructions as provided in this article. The first is the simple program that can be included with the handler instructions; it provides a complete documentation printout for random access files and variables used. Once the development of a program is complete, the instruction Run 10000 will provide this printout, and the documentation generator program (lines 10000–10520) can then be deleted from the applications program.

The second advantage is that a descriptive name is associated with every data element. These names, if carefully thought out, can be used in video displays and printouts simply by referencing the variable names associated with them.

```
9400 DEFINT F
9410 READ F
9420 DIM F$(F), FR$(F), FL(F), FR(F)
9430 FOR I=1 TO F
9440      READ F$(I), FL(I)
9490 NEXT I
9495 RETURN
9500 OPEN"R",1,F$(F)
9502 FI=INT(255/FL(F))
9504 FP=INT((FR(F)-1)/FI)+1
9506 FS=FR(F)-FI*(FP-1)-1
9510 FIELD 1, (FL(F)*FS)ASFD$, FL(F)ASFQ$
9520  IF  FP)LOF(1)  THEN  LSET  FQ$=STRING$(FL(F),32):
      PUT1,FP
9530 GET 1,FP: IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1,FP
9550 CLOSE: RETURN
9600 DATA 3
9610 DATA NAMEFILE/DAT, 42
9620 DATA ACCOUNTS/DAT, 51
9630 DATA COMMENTS/DAT, 85
```

Listing 1. TRS-80 listing for the random access disk handler routines presented in the first part of this article (see the September 1983 Microcomputing *p. 80).*

Basic File Handler Routine

In this section, we'll review the random access I/O handler routines provided in the previous article. Listing 1 shows this instruction set for the TRS-80, along with a sample set of data statements that might be used with it. Listing 2 provides the same routines for use on the IBM PC.

The subroutine contained in lines 9400–9495 is called only once at the beginning of the program; it serves to read the data elements into memory. The first data element must specify the total number of files to be used by the program so that the dimension statement in line 9420 can be set up.

Each file is represented by a pair of data elements, the first naming the file (as it appears on disk) and the second

Address correspondence to Dan Bishop, PO Box 429, Buena Vista, CO 81211.

specifying the size of each subrecord within that file. These items are stored in F$(F) and FL(F), respectively.

Once the program has passed through these preliminaries, the elements within each subrecord that is to be stored to disk are packed into the string FR$(F), where F, as always, denotes which file we are working with at the time. The MID$ function is used for this purpose, in the following form:

```
MID$(FR$(F),21,15) = AD$
```

This example packs the string represented by AD$ into 15 consecutive bytes of FR$(F), starting at byte number 21. When FR$(F) is ready to be saved to disk, the program must specify which subrecord number is represented by FR$(F) (that is, where in the file this subrecord should be placed).

This is done by giving the appropriate value to FR(F). Then FA is set to 1, which denotes that you're planning to put the subrecord into the disk file, and you execute a Gosub 9500.

When you wish to retrieve a subrecord from disk, you again must specify which file you're working with by assigning the appropriate value to F, assigning a value to FR(F) to indicate which subrecord you wish to withdraw, and setting FA to 0, which denotes that you wish to get the subrecord from the disk. Execute a Gosub 9500, and *voila*! FR$(F), containing the subrecord string, is returned. Of course, to get data from this string, we again use the MID$ function, this time in the following form:

```
AD$ = MID$(FR$(F),21,15)
```

Note that the handler routines in 9400-9495 and 9500-9550 do not change, regardless of the application. These lines can be saved to disk and can form the nucleus for every program you write that involves disk I/O. The only changes to be made are in the data statements, which are tailored to the specific program.

Wouldn't It Be Nice. . .

Thinking a bit further, however, wouldn't it be nice to con the computer into automatically handling all of the MID$ functions as well? As it is, if you're using four data files, you need four subroutines to pack data into the respective FR$(F) strings and four subroutines to unpack the data when you pull the FR$(F) strings from the disk.

. . . wouldn't it be nice to con the computer into automatically handling all of the MID$ functions?

If this routine could be generalized, you would need only two subroutines; one would do the packing for any file, and the other would do the unpacking. Furthermore, if the program is so completely generalized, much of the documentation for the disk I/O and its related variables can be done automatically as well.

Are you ready? Here goes. . .

Generalizing the MID$ Operations

Before going any further, I must admit that it's fun to see descriptive variable names within a program. In fact, descriptive variable names provide a certain degree of self-documentation. NM$ for name, AD$ for address and ZAP# for an overdrawn account balance are useful.

However, in long programs, so many variables must be used that ambiguity frequently arises; to follow the program, you'll need to refer to a variables list anyway. With the techniques described below, the variable names become completely generalized, but with the documentation generator program, the variables list is automatically updated and available for printout and reference.

With the simplified I/O handler, the only information you need to include in your data statements after each file name is the byte count for subrecords used within that file. Now you need to add more information about each subrecord.

The first new data element will be the number of discrete items of information included within the subrecord. Then each item is named in the order of its appearence within that subrecord, followed by the number of bytes that the individual item uses.

The only restriction is that the first file presented in the data statements must be the file that has the largest number of items within each subrecord. This requirement is necessary in order that the dimension statements be initially set up to be large enough for all of the files in the program.

You also should double-check to be sure that the byte counts for the individual records within a file will total the subrecord byte count indicated directly after the file name. Refer to lines between 9600 and 9699 in Listing 3 to see how these data statements are set up.

Line 9600 contains one data element. The number 4 tells the computer that the program will be using four random access disk files. Lines 9610, 9620, 9630 and 9640 contain specific information relating to each of these four files.

Consider, for example, line 9610. The first data item listed is the name of the file. This is followed by the total number of bytes used by that file—in this case, it's 42. The 6 tells the com-

```
9400 DEFINT F
9410 READ F
9420 DIM F$(F), FR$(F), FL(F), FR(F)
9430 FOR I=1 TO F
9440      READ F$(I), FL(I)
9490 NEXT I
9495 RETURN


9500 OPEN "R",1,F$(F),FL(F)
9510 FIELD 1, FL(F) AS FQ$
9520 GET 1,FR(F): IF LEN(FQ$)=0 THEN FQ$=STRING$(FL(F),32): PUT
     1,FR(F)
9530 GET 1,FR(F): IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1,FR(F)
9550 CLOSE: RETURN


9600 DATA 3
9610 DATA A:NAMEFILE.DAT, 42
9620 DATA B:ACCOUNTS.DAT, 51
9630 DATA B:COMMENTS.DAT, 85
```

Listing 2. IBM PC listing for random access disk handler routines presented in the first part of this article.

```
THERE ARE 4  RANDOM ACCESS FILES FOR THIS PROGRAM
     REPRESENTED BY THE VARIABLE  F.

     F$(F)        THE ACTUAL FILE NAMES.
     FL(F)        THE SUBRECORD LENGTH FOR FILE F.
     I(F)         NUMBER OF ITEMS IN EACH SUBRECORD.
                  FOR FILE F.

     ID$(J,F)     THE ITEM NAME FOR THE J'TH ITEM
                  IN FILE F.
     IL(J,F)      THE BYTE COUNT FOR THE J'TH ITEM
                  IN FILE F.
     IB(J,F)      THE STARTING BYTE NUMBER TO USE
                  IN THE MID$ FUNCTIONS TO LOCATE
                  THE J'TH ITEM IN FILE F.
     IC$(J,F)     THE ACTUAL DATA VALUE FOR THE
                  J'TH ITEM IN FILE F.

     FR$(F)      THE FULL STRING SUBRECORD EITHER
                 STORED TO OR RETRIEVED FROM DISK.
     FR(F)       THE SUBRECORD NUMBER SPECIFIED IN
                THE PROGRAM TO BE SAVED OR RETRIEVED

     FI          THE NUMBER OF SUBRECORDS PER RECORD.
     FP          THE RECORD # THAT CONTAINS FR(F).
     FS          THE SUBRECORD (COUNTING FROM ZERO)
                 NUMBER WITHIN RECORD FP THAT CORRES-
                 PONDS TO SUBRECORD FR(F).
     FA          SPECIFIED BY THE CALLING PROGRAM.
                 IT IS 0 TO GET ONLY; 1 TO PUT.

     IJ          FLAG TO AVOID REDIMENSIONING ARRAYS
     IB          BYTE COUNTER TO CALCULATE IB(J,F)
     FD$         DUMMY STRING FOR FIELD BUFFER.
     FO$         THE DESIRED SUBRECORD STRING USED IN
                 THE FIELD BUFFER.

================================================================================
```

Fig. 1. Page 1 of documentation printout produced by documentation generator program (Listing 4). This page defines the variables used by the disk I/O routines.

```
FILE  1 :   TESTONE/DAT
SUBRECORD LENGTH:       42  BYTES.
ITEMS PER SUBRECORD:    6

     ITEM  1 ... IC$( 1, 1) ... NAME              -  20 BYTES ( 1)
     ITEM  2 ... IC$( 2, 1) ... ADDRESS           -  15 BYTES (21)
     ITEM  3 ... IC$( 3, 1) ... SEX               -   1 BYTES (36)
     ITEM  4 ... IC$( 4, 1) ... AGE               -   2 BYTES (37)
     ITEM  5 ... IC$( 5, 1) ... MONTH BORN        -   2 BYTES (39)
     ITEM  6 ... IC$( 6, 1) ... EDUCATION         -   2 BYTES (41)

================================================================================

FILE  2 :   TESTTWO/DAT
SUBRECORD LENGTH:       31  BYTES.
ITEMS PER SUBRECORD:    5

     ITEM  1 ... IC$( 1, 2) ... INTEREST 1        -  10 BYTES ( 1)
     ITEM  2 ... IC$( 2, 2) ... INTEREST 2        -  10 BYTES (11)
     ITEM  3 ... IC$( 3, 2) ... AMOUNT            -   4 BYTES (21)
     ITEM  4 ... IC$( 4, 2) ... BOOKS             -   4 BYTES (25)
     ITEM  5 ... IC$( 5, 2) ... NOT USED          -   3 BYTES (29)

================================================================================

FILE  3 :   TESTTHRE/DAT
SUBRECORD LENGTH:       31  BYTES.
ITEMS PER SUBRECORD:    2

     ITEM  1 ... IC$( 1, 3) ... PHONE             -  12 BYTES ( 1)
     ITEM  2 ... IC$( 2, 3) ... MAIDN NAME        -  19 BYTES (13)

================================================================================

FILE  4 :   TESTFOUR/DAT
SUBRECORD LENGTH:       85  BYTES.
ITEMS PER SUBRECORD:    1

     ITEM  1 ... IC$( 1, 4) ... COMMENTS          -  85 BYTES ( 1)

================================================================================
```

Fig. 2. Page 2 of documentation printout produced by documentation generator program (Listing 4). This page gives file specifications and variable names and details for individual items fielded within each subrecord.

puter that there are six data elements to be fielded within each subrecord of this file. The remaining data items in line 9610 are six pairs of information, each listing the name of the data to be stored in that particular field, followed by the number of bytes to be reserved for that item.

Once the data statements, along with lines 9400-9550 and the documentation-generator program (lines 10000 to 10520, Listing 4), are in place, be sure the printer is on, and enter the command RUN 10000. You'll get two pages of documentation relating to the random access disk files.

With these program lines, it's an easy matter to add new records to a file and to edit those records.

The first page is a page of definitions for the disk handler variables. The second page will list the files used by your program, along with a variables list for each item within each file.

Figs. 1 and 2 illustrate these pages for the sample listing shown. Note that each variable packed into FR$(F) is presented as IC$(J,F), where F refers to the file number (as always) and J refers to the item number within the subrecord. The documentation uses the descriptive name you placed in the data statement to identify that variable. The number of bytes and the starting position within FR$(F) for that variable are also listed.

In order to set the file handler routine into operation, you must be sure to clear enough string space at the start of the program (if using a TRS-80), and execute a Gosub 9400. From then on, whenever you wish to get subrecord FR(F) from file F, simply use the following statement, filling in the appropriate numbers:

```
F=# : FR(F)=### : GOSUB 9000
```

Not only will the subrecord FR$(F) be returned to you, but so will all of the individual items, as IC$(J,F), unpacked and ready for use.

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MICROMATION introduces a new line of products designed to enhance Heathkit's® HERO-I robot. These products eliminate the current problem of having to hand code programs into the robot. They provide the software and hardware necessary to allow rapid development of long, meaningful programs for HERO on your personal computer. Our software will also provide you with examples of advanced programming techniques and show you how to generate artificial intelligence programs in machine language.

HERO MEMCOM BOARD

This product provides a means to develop programs for the robot using a personal computer, and expands the robot's memory with an additional 30K of RAM. A large wire-wrapping area is also available on the board for user experimentation. The product includes:

- Two 8-bit bi-directional parallel ports with handshaking lines for superfast data transfers between the robot and a computer (connects directly to our APPLE-HERO COMMUNICATOR board), plus two 16-bit timers.
- An RS232 serial port for two-way communications between the robot and any computer having an RS232 serial port.
- Serial communications software in an onboard EPROM which allows uploading and downloading of programs via the RS232 port.
- Sixteen 2K RAM chips in sockets so 2K EPROM chips may be substituted, if desired. "Memory Protect" and "Ram Supply" are used for each RAM chip so programs will not be lost when robot enters "sleep" mode.
- A large (2" x 5") wire-wrap area with CPU address, data and control lines, ±5V, ground, and others readily available.
- All hardware to mount board on rear door of robot and to connect board to the robot's CPU board.
- Complete instruction manual and schematics.

PRICE $295.00

APPLE-HERO COMMUNICATOR

This product provides the hardware and software necessary to implement two-way high speed parallel communications between an APPLE® computer and a HERO-I robot equipped with our HERO MEMCOM BOARD. The product includes:

- A peripheral card for an APPLE that contains two 8-bit parallel ports with handshaking lines, and two 16-bit timers.
- A ribbon cable (about 5 feet long) with connectors for connecting the parallel ports on the card to those on the HERO MEMCOM BOARD.
- Data transfer software for the APPLE board and for the HERO MEMCOM BOARD burned into two 2716 EPROMs. These programs provide ultra fast two-way communications for rapid downloading and uploading of programs.
- A disk containing heavily commented 6808 and 6502 source codes for the communications software. These source codes are compatible with the S-C MACRO ASSEMBLER and the S-C 6800 CROSS ASSEMBLER available for the APPLE from the S-C SOFTWARE CORPORATION. Programs developed using the S-C 6800 CROSS ASSEMBLER can be immediately downloaded and run on the robot using this product and our HERO MEMCOM BOARD.

PRICE $159.00

STORYTELLER

This is an artificial intelligence program that turns HERO into a teller of galactic tales. The program uses an advanced self-programming technique which allows the robot to speak randomly generated, but grammatically correct, sentences concerning his space voyages. The program is both amazing and amusing. After listening to the robot for a while one gets the impression that it has just returned from a space battle with alien invaders.

PRICE: Tape (machine code) **$15.00** Disk (source code) **$25.00**

ROBOT LANGUAGE MACRO

This program consists of an S-C 6800 CROSS ASSEMBLER macro source code which completely implements the HERO Robot Language opcodes. This macro provides the user with a very fast means of developing programs for the robot when used in conjunction with our APPLE-HERO COMMUNICATOR and HERO MEMCOM BOARD. The S-C 6800 CROSS ASSEMBLER is required in order to use this product.

PRICE $35.00

6808 CROSS DISASSEMBLER

This program allows 6808 machine code resident in an APPLE's memory to be disassembled in a format similar to that used by the APPLE monitor. Disassembly can be performed optionally into text files for later EXECing into the 6800 CROSS ASSEMBLER. Machine code resident in HERO's memory (like the robot's monitor) can be made into source codes by first transferring the code to the APPLE's memory (using the APPLE-HERO COMMUNICATOR and HERO MEMCOM BOARD) and then disassembling to a text file. This text file can then be EXECed into the S-C 6800 CROSS ASSEMBLER and meaningful comments added. Source code for the program is also available.

PRICE: Program only **$35.00** Program and source code **$55.00**

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as simple. Be sure that all of the variables, as IC$(J,F), have their proper values. Then use the following statement:

F=# : FR(F)=### : GOSUB 9200

Be sure to substitute the desired numbers for the file number and subrecord number in place of the "#s" in the statement shown. FR$(F) will automatically be packed and stored to disk.

Handling Numeric Data

One thing the generalized instruction set cannot anticipate is which variables, packed into FR$(F) in string format, are actually to be used as numeric variables within the program. Each integer and single-precision and double-precision number is represented within the subrecord string as two-byte, four-byte and eight-byte strings, respectively.

When these strings are unpacked after the subrecord has been retrieved from disk, they're still in string form, represented with the appropriate J and F values as IC$(J,F).

In order to convert these strings into their appropriate numeric forms, line 9040 and lines 9100–9199 are used. Line 9040 uses the value of F (the file number) to direct the program to subroutines between lines 9100 and 9199, which carry out the numeric conversion process.

Each file will have its own subroutine. Notice in the sample data pro-

```
ONLY LINES 9100-9199,  9300-9399, AND 9600-9699 WILL VARY FROM
      ON PROGRAM TO THE NEXT

9000 FA=0: GOSUB9500
9010 FOR J=1 TO I(F)
9020      IC$(J,F)=MID$(FR$(F),IB(J,F),IL(J,F))
9030 NEXT J
9040 ON F GOSUB 9100, 9120, 9140, 9160
9050 RETURN
9100 AG%=CVI(IC$(4,1))
9102 MB%=CVI(IC$(5,1))
9104 ED%=CVI(IC$(6,1))
9110 RETURN
9120 AM!=CVS(IC$(3,2))
9122 BK!=CVS(IC$(4,2))
9130 RETURN
9140 RETURN
9160 RETURN
9200 ON F GOSUB 9300, 9320, 9340, 9360
9210 FR$(F)=STRING$(FL(F),32)
9220 FOR J=1 TO I(F)
9230      MID$(FR$(F),IB(J,F),IL(J,F))=IC$(J,F)
9240 NEXT J
9250 FA=1: GOSUB9500
9260 RETURN
9300 IC$(4,1)=MKI$(AG%)
9302 IC$(5,1)=MKI$(MB%)
9304 IC$(6,1)=MKI$(ED%)
9310 RETURN
9320 IC$(3,2)=MKS$(AM!)
9322 IC$(4,2)=MKS$(BK!)
9330 RETURN
9340 RETURN
9360 RETURN
9400 DEFINT F,I
9410 READ F
9420 DIM F$(F),FR$(F),FL(F),FR(F),I(F)
9430 FOR I=1 TO F
9440      READ F$(I),FL(I),I(I)
9450      IB=1
9455      IF IJ=1 THEN 9460
9458           DIM ID$(I(I),F),IC$(I(I),F),IB(I(I),F),IL(I(I),F)
9459           IJ=1
9460      FOR J=1 TO I(I)
9470           READ ID$(J,I),IL(J,I)
9480           IB(J,I)=IB: IB=IB(J,I)+IL(J,I)
9485      NEXT J
9490 NEXTI
9495 RETURN
9500 OPEN"R",1,F$(F)
9502 FI=INT(255/FL(F))
9504 FP=INT((FR(F)-1)/FI)+1
9506 FS=FR(F)-FI*(FP-1)-1
9510 FIELD 1,(FL(F)*FS)ASFD$,FL(F)ASFQ$
9520 IF FP)LOF(1) THEN LSETFQ$=STRING$(FL(F),32): PUT1,FP
9530 GET 1,FP: IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1,FP
9550 CLOSE: RETURN
9600 DATA 4
9610 DATA TESTONE/DAT,42,6,"NAME      ",20,"ADDRESS   ",15,"SEX       ",1,"AGE
     ",2,"MONTH BORN",2,"EDUCATION ",2
9620 DATA TESTTWO/DAT,31,5,"INTEREST 1",10,"INTEREST 2",10,"AMOUNT    ",4,"BOOKS
     ",4,"NOT USED  ",3
9630 DATA TESTTHRE/DAT,31,2,"PHONE     ",12,"MAIDN NAME",19
9640 DATA TESTFOUR/DAT,85,1,"COMMENTS  ",85
```

Listing 3. Complete random access disk handler routines, including automatic string packing and unpacking procedures. To alter this listing for use with the IBM PC, use lines 9500–9550 from Listing 2 in place of lines 9500–9550 in this listing. Also, alter the file names in the data statements (lines 9600–9640) to correspond to IBM PC format.

vided with Listing 3 that files 1 and 2 do contain numeric data, and that the conversions for the numeric information in each of these files is carried out in lines 9100–9110 and 9120–9130, respectively.

Similarly, the string packing routine is located at lines 9200–9299, with line 9200 using the value of F to direct the program to various subroutines between lines 9300 and 9399, which convert numeric data into packed string format. Again, each file will have its own subroutine. Notice the similarity between the subroutines in lines 9100–9199 and the subroutines in lines 9300–9399.

The documentation will not include the variables you assign to your numbers in the conversion routines, so you must keep track of these yourself. However, with these lines filled into your program as needed, when you return from a Gosub 9000, all of your individual data items from within that subrecord will be ready to be used by your program. Similarly, a Gosub 9200 will take all of your variables for a given subrecord and do any numeric conversions necessary before packing the strings into FR$(F) and storing the subrecord to disk.

Video Display Identifiers

The item descriptors that you have placed into your data statements are stored within the program using the same subscripts as the corresponding data elements. The data elements are stored as IC$(J,F) elements, while the descriptors are stored as ID$(J,F) elements.

Consequently, if care is taken to use the proper number of characters (and blanks) in each of these descriptors, then they can be used to set up professional-looking video displays with simple print statements. The following routine illustrates how this could be done:

```
yyy CLS
    FOR I=1 TO I(F)
        PRINT I": "ID$(I,F)"... "IC$(I,F)
    NEXT I
```

This routine will display each element in file F on the video screen, preceded by its name descriptor. Of course, if this routine were to be used, any numeric data would have to be converted into string form using the STR$ function, with the string representation assigned to the appropriate IC$(J,F) variable. This could be done at the same time the conversion from packed string data is carried out in lines 9100–9199.

Lines such as the following could be used:

```
AM! = CVS(IC$(3,1))
IC$(3,1) = STR$(AM!)
```

The above routine makes editing extremely easy. The following instructions place a prompt on the screen below the information displayed by the above routine. You'll need to enter only the number corresponding to the displayed data to be changed (as displayed by I in the above routine), and the new data entered by the input statement is automatically assigned to the appropriate variable.

```
zzz INPUT"ENTER THE NUMBER OF THE
          ITEM TO BE CORRECTED, OR
          ZERO.";Z
    IF Z=0 THEN GOTO xxx
    IF Z<0 OR Z>I(F) THEN zzz
    INPUT"ENTER THE CORRECTED ITEM
          ...";IC$(Z,F)
    GOTO yyy
```

As soon as the correction is entered, the screen clears and the revised data set is displayed, with the prompt at the bottom allowing further corrections. Entering a zero transfers the program on to the next set of instructions, beginning at line number xxx.

Conclusion

Enter the random access disk handler routine shown in Listing 3 (omitting lines 9600–9699, 9100–9139 and 9300–9330, and adding return instructions at lines 9100, 9120, 9300 and 9320), and add to it the documentation generator program provided in Listing 4. Then save this program on your work disk to serve as the nucleus for your future programs.

Your random access procedures will be forever simplified, your documentation will be easier than ever to write (the computer doing a share of it for you), and data entry, display and editing will never be easier.

This article demonstrates how easy setting up random access disk files can be. With these program lines, it's an easy matter to add new records to a file and to edit those records.■

```
10000 CLEAR 2000:GOSUB9400
10010 SQ$="ITEM ## ... IC$(%   %) ... %              % - ### BYTES (##)"
10020 SP$=STRING$(10,32): ST$=STRING$(70,"=")
10030 LPRINTSP$;SP$"DISK FILE I/O DOCUMENTATION"
10040 LPRINTSP$;ST$
10050 LPRINT" "
10060 LPRINTSP$"THERE ARE"F" RANDOM ACCESS FILES FOR THIS PROGRAM"
10070 LPRINTSP$"      REPRESENTED BY THE VARIABLE  F.":LPRINT" "
10080 LPRINTSP$"     F$(F)        THE ACTUAL FILE NAMES."
10090 LPRINTSP$"     FL(F)        THE SUBRECORD LENGTH FOR FILE F."
10100 LPRINTSP$"     I(F)         NUMBER OF ITEMS IN EACH SUBRECORD."
10110 LPRINTSP$"                  FOR FILE F.": LPRINT" "
10120 LPRINTSP$"     ID$(J,F)     THE ITEM NAME FOR THE J'TH ITEM"
10130 LPRINTSP$"                  IN FILE F."
10140 LPRINTSP$"     IL(J,F)      THE BYTE COUNT FOR THE J'TH ITEM"
10150 LPRINTSP$"                  IN FILE F."
10160 LPRINTSP$"     IB(J,F)      THE STARTING BYTE NUMBER TO USE"
10170 LPRINTSP$"                  IN THE MID$ FUNCTIONS TO LOCATE"
10180 LPRINTSP$"                  THE J'TH ITEM IN FILE F."
10190 LPRINTSP$"     IC$(J,F)     THE ACTUAL DATA VALUE FOR THE "
10200 LPRINTSP$"                  J'TH ITEM IN FILE F.":LPRINT" "
10210 LPRINTSP$"     FR$(F)      THE FULL STRING SUBRECORD EITHER"
10220 LPRINTSP$"                 STORED TO OR RETRIEVED FROM DISK."
10230 LPRINTSP$"     FR(F)       THE SUBRECORD NUMBER SPECIFIED IN"
10240 LPRINTSP$"                 THE PROGRAM TO BE SAVED OR RETRIEVED":LPRINT" "
10250 LPRINTSP$"     FI        THE NUMBER OF SUBRECORDS PER RECORD."
10260 LPRINTSP$"     FP        THE RECORD # THAT CONTAINS FR(F)."
10270 LPRINTSP$"     FS        THE SUBRECORD (COUNTING FROM ZERO)"
10280 LPRINTSP$"               NUMBER WITHIN RECORD FP THAT CORRES-"
10290 LPRINTSP$"               PONDS TO SUBRECORD FR(F)."
10300 LPRINTSP$"     FA        SPECIFIED BY THE CALLING PROGRAM.  "
10310 LPRINTSP$"               IT IS 0 TO GET ONLY; 1 TO PUT.":LPRINT" "
10320 LPRINTSP$"     IJ        FLAG TO AVOID REDIMENSIONING ARRAYS"
10330 LPRINTSP$"     IB        BYTE COUNTER TO CALCULATE IB(J,F)"
10340 LPRINTSP$"     FD$       DUMMY STRING FOR FIELD BUFFER."
10350 LPRINTSP$"     FQ$       THE DESIRED SUBRECORD STRING USED IN"
10360 LPRINTSP$"               THE FIELD BUFFER."
10370 LPRINT" ":LPRINTSP$;ST$
10380 FOR I=1 TO 24: LPRINT" ": NEXT I
10390 LPRINTSP$"RANDOM ACCESS FILE SPECIFICATIONS"
10400 LPRINTSP$;ST$
10410 FOR I=1 TO F
10420    LPRINT" ":LPRINTSP$"FILE "I":   "F$(I)
10430    LPRINTSP$;TAB(10)"SUBRECORD LENGTH:     "FL(I)" BYTES."
10440    LPRINTSP$;TAB(10)"ITEMS PER SUBRECORD:  "I(I)
10450    LPRINT " "
10460    FOR J=1 TO I(I)
10470    T$=RIGHT$(STR$(J),2)+","+RIGHT$(STR$(I),2)
10480    LPRINTTAB(15);:LPRINTUSINGSQ$;J,T$,ID$(J,I),IL(J,I),IB(J,I)
10490    NEXT J
10500  LPRINT" ":LPRINTSP$;ST$
10510 NEXTI
10520 END
```

Listing 4. Disk I/O documentation generator program. For the IBM PC, lines 10250–10290 and line 10340 may be omitted.

Buyer's Guide To $2500–$4000 Systems

Today's microcomputer market is flooded with a seemingly endless stream of systems—varying in memory, disk drive capacity, screen display size. . ., but which one should you buy? **Microcomputing** *can help you decide. This month we continue our buyer's guide series focusing on systems in the $2500 to $4000 range. It breaks each micro down into 11 categories, so you can compare the capabilities most important to you. Next month,* **Microcomputing** *will cover systems in the $4000 to $6000 range.*

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration	Memory Capacity
Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014	Apple III	4¾ × 17½ × 18¼	26 lbs.	2695	6502A	8-Bit	256K RAM 4K ROM
Athena Computer & Electronics 31952 Camino Capistrano San Juan Capistrano, CA 92675	Athena	3⅜ × 11⅞ × 14½	16 lbs.	3250	Dual NSC-800	8-Bit	68K RAM 16K ROM
Billings Computer Corp. 18600 E. 37th Terrace S. Independence, MO 64057	100 Computer System	20 × 16 × 17	80 lbs.	3000	Z-80A	8-Bit	56K RAM 8K ROM
	500 Systems II	20 × 16 × 17	82 lbs.	3375	Z-80A	8-Bit	56K RAM 8K ROM
	B-500	20 × 16 × 17	45 lbs.	3375	Z-80A	8-Bit	56K RAM 8K ROM
Bytec Management Corp. 8 Colonnade Road Ottawa, Canada K2E 7M6	Hyperion 3031	18¼ × 11¼ × 8¾	21 lbs.	3195	8088	16-Bit	256K RAM 8K ROM
California Computer Systems 250 Caribbean Drive Sunnyvale, CA 94086	CalStar	12 × 20½ × 7¼	40 lbs.	2795	Z-80A	8-Bit	126K-256K RAM
Columbia Data Products 8990 Route 108 Columbia, MD 21045	Multi Personal Computer/1600	5 × 22½ × 15	25 lbs.	3395	8088	8- or 16-Bit	128K-1M RAM 16K ROM
Compal 8500 Wilshire Blvd. Beverly Hills, CA 90211	EZ-Type	16 × 14 × 16	38 lbs.	3495	Z-80; 8088	8- or 16-Bit	64K-256K RAM 64K ROM
Compaq Computer Corp. 20333 FM149 Houston, TX 77070	Compaq Portable Computer	20 × 8½ × 16	28 lbs.	2995	8088	16-Bit	128K-512K RAM 8K ROM
Computer Devices, Inc. 25 North Ave. Burlington, MA 01803	Dot	7½ × 17¾ × 14¾	35 lbs.	3295	8088	8- or 16-Bit	128K-704K RAM 64K ROM

N/A = Not available

Compiled by Michele Christian

†*The Compaq computer is a 28-pound portable system that features 128K–512K RAM.*

The 8088-based 16-bit IBM PC.→

Disk Drive		Operating	Hard Disk		Display		
Capacity	Size	System	Capacity	Size	Format	Color	Interface
140K	5¼"	SOS	5M	5¼"	80×24	No	RS-232; Parallel optional
200K	5¼"	CP/M	30M	5¼"	80×4	No	RS-232; Parallel
152K	5¼"	Proprietary	N/A	N/A	80×24	No	RS-232; Parallel
720K per drive	5¼"	Proprietary	N/A	N/A	80×24	No	RS-232; Parallel
720K per drive	5¼"	Proprietary	N/A	N/A	80×24	Yes	RS-232; Parallel
320K	5¼"	MS-DOS	Available	5¼"	80×25	No	RS-232; Parallel
2.4M	8"	CP/M	N/A	N/A	Varies	No	RS-232; Parallel
320K	5¼"	MS-DOS; CP/M-86; MP/M-86	10M	5¼"	80×25	Yes	RS-232; Parallel
800K	5¼"	CP/M-86/80	10M	5¼"	80×24	Yes	RS-232
320K	5¼"	Proprietary	N/A	N/A	80×25	Yes	Parallel; RS-232 optional
280K	3½"	MS-DOS	N/A	N/A	640×200 Pixels	No	RS-232; Parallel optional

***Suggested retail price**

←The Hyperion is a 16-bit, 21-pound portable with 256K.

The Fujitsu Micro 16s features up to 1M of RAM.→

The Eagle computer. →

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration	Memory Capacity
Data Technology Industries 701-A Whitney St. San Leandro, CA 94577	Associate	13×21×20	42 lbs.	3450	Z-80	8-Bit	64K-256K RAM 10K ROM
Datapoint Corp. 9725 Datapoint Drive San Antonio, TX 78249	1560	12¼×20×22¾	54 lbs.	3195	Z-80A	8-Bit	64K-128K RAM 12K ROM
Digilog Business Systems, Inc. Welsh Road & Park Drive PO Box 425 Montgomeryville, PA 18936	DBS 16	8×12×14	30 lbs.	3495	80186	16-Bit	256K-3.5M RAM
	S-1000	21½×13¾×19¾	50 lbs.	2995	Z-80A	8-Bit	64K RAM 2KROM
	S-1016	21½×13¾×19¾	50 lbs.	3995	Z-80A, 80186	8- or 16-Bit	64K-256K RAM
Eagle Computer, Inc. 983 University Ave., Building C Los Gatos, CA 95030	Eagle II	21×13½×18	42 lbs.	2995	Z-80A	8-Bit	64K RAM 8K ROM
	Eagle III	21×13½×18	42 lbs.	3995	Z-80A	8-Bit	64K RAM 8K ROM
Fujitsu Microelectronics, Inc. 3320 Scott Blvd. Santa Clara, CA 95051	Micro 16s	5¾×19×14½	33 lbs.	3995	Z-80; 8086	8- or 16-Bit	128K-1M RAM 4K ROM
High Technologies, Inc. PO Box 953 Sandy, UT 84901	Mayflower II	9×16×25	35 lbs.	3750	Z-80A	8-Bit	128K-1M RAM 64K ROM
Hitachi Sales Corp. 401 West Artesia Blvd. Compton, CA 90220	Personal Computer MBE 16000	19¼×12×9	32 lbs.	3000	8088	16-Bit	320K-576K RAM 16K ROM
IBM Corp. PO Box 1328 Boca Raton, FL 33444	IBM PC	5½×15×15	50 lbs.	2953	8088	16-Bit	16K-256K RAM 40K ROM
IMS International 2800 Lockheed Way Carson City, NV 89701	IMS 5000 IS	14¼×21×15½	45 lbs.	3700	Z-80	8-Bit	64K-1M RAM 4K ROM
	IMS 5000SX	7¼×17½×22¼	69 lbs.	3300	Z-80	8-Bit	64K-1M RAM 4K ROM

N/A = Not available

Disk Drive Capacity	Disk Drive Size	Operating System	Hard Disk Capacity	Hard Disk Size	Display Format	Color	Interface
360K	5¼"	CP/M	5M-20M	8", 5¼"	80×25	No	RS-232; Parallel optional
2M	8"	CP/M or DOS.H	40M	5¼"	80×24	No	RS-232
800K	5¼"	CP/M or DOS.H	40M		80×25	To Be Announced	RS-232; Parallel
664K	5¼"	CP/M	N/A	N/A	80×24	No	RS-232; Parallel
360K, 800K	5¼"	CP/M; CP/M-86	N/A	N/A	80×24	No	RS-232; Parallel
780K	5¼"	CP/M	10M-40M		80×24	No	RS-232; Parallel
1.6M	5¼"	CP/M	10M-40M		80×24	No	RS-232; Parallel
320K-1.2M	5¼" or 8"	CP/M-86; CCP/M-86	10M-20M	5¼"	640×200	Yes	RS-232; Parallel
1M per drive	5¼"	CP/M 2.2	N/A	N/A	80×25	No	RS-232C; Parallel
320K	5¼"	MS-DOS; CP/M-86	10M	5¼"	80×25	Yes	RS-232; Parallel
160K-320K	5¼"	Prop.DOS or CP/M-86	Variable	5¼" or 8"	80×25	Yes	RS-232
1.6M	5¼"	CP/M or Turbo DOS	23.55M	5"	720×300 Pixels	No	RS-232; Parallel optional
1.6M	5¼"	CP/M or Turbo DOS	47.10M	5¼"	720×300 Pixels	No	RS-232; Parallel optional

***Suggested retail price**

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration	Memory Capacity
Intecolor Corp. 225 Technology Park Norcross, GA 30092	Intecolor 3651	13¾ × 19¾ × 26⅝	50 lbs.	2945	8080A	8-Bit	32K RAM 16K ROM
Jonos, Ltd. 1835 Dawns Way Fullerton, CA 92631	C2100	7¼ × 17¼ × 13¼	25 lbs.	3995	Z-80A	8-Bit	64K-128K RAM 2K-8K ROM
	C68000	7¼ × 17¼ × 13¼	25 lbs.	3995	68000	16-Bit	256K-2M RAM 2K-8K ROM
Kaypro 533 Stevens Ave. Solana Beach, CA 92075	Kaypro 10	18 × 8 × 15½	31 lbs.	2795	Z-80	8-Bit	64K RAM 4K ROM
MAI/Basic Four Business Products 601 San Pedro NE Albuquerque, NM 87108	Basic Four S/10	11¾ × 20 × 22	45 lbs.	3995	Z-80A	8-Bit	128K RAM 16K ROM
Micro Source, Inc. 635 W. Main St., PO Box 319 New Lebanon, OH 45345	M6000P	7 × 17 × 20	32-35 lbs.	3900	Z-80A	8- or 16-Bit	64K-512K RAM 8K ROM
Micro Technology Unlimited 2806 Hillsborough St. Raleigh, NC 27605	MTU-140	CPU—13½ × 14 × 20¼; Keyboard—8 × 19 × 1.6	45 lbs.	3900	6502	8-Bit	80K-1.33M RAM 16K ROM
Micro-Link Corp. 14602 N. US 31 Carmel, IN 46032	Approach II	13¼ × 20	45 lbs.	3995	Z-80A	8-Bit	64K-256K RAM 16K ROM
Monroe Systems For Business The American Road Morris Plains, NJ 07950	OC 8810/20; EC 8800	11⅗ × 19 × 21	50 lbs.	3295	Z-80A	8-Bit	128K RAM
NEC Information Systems, Inc. 5 Militia Drive Lexington, MA 02173	APC	18½ × 16 × 13	52 lbs.	2748	NEC 8086	16-Bit	128K-640K RAM 8K ROM
Olympia, U.S.A. PO Box 22 Somerville, NJ 08876	People	CPU—19 × 14 × 6½ Keyboard—8 × 18½ × 1¾	50 lbs.	3595	8086	16-Bit	32K-64K RAM 8K ROM
Otrona Advanced Systems Corp. 4755 Walnut St. Boulder, CO 80301	Attache	12 × 5¾ × 13⅝	19.5 lbs.	2695	Z-80A; 8086 opt.	8- or 16-Bit	64K-32K RAM 8K ROM
Polymorphic Systems 5730 Thornwood Drive Santa Barbara, CA 93117	88	5½ × 15 × 17	29 lbs.	3995	80186	16-Bit	256K-1M RAM 4K ROM
	8810	5½ × 15 × 17	26 lbs.	3595	8080	8-Bit	32K-64K RAM 8K ROM
	Poly 186	5½ × 15 × 17	37 lbs.	3995	Z-80A; 80186	8- or 16-Bit	256K-1M RAM 4K ROM
Product Associates, Inc. 465 Convention Way Redwood City, CA 94063	Z-Disk	16 × 16 × 16	26 lbs.	2995	Multiple Z-80A	8-Bit	64K-384K RAM 8K ROM
Quasar Data Products 10330 Brecksville Road Cleveland, OH 44141	QDP-200/QDP-300	8½ × 18 × 19	50 lbs.	3495/3995	Z-80A/Z-80B	8- or 16-Bit	64K-512K RAM 8K ROM
Quay Corp. 22 Meridian Road, PO Box 783 Eatontown, NJ 07724	540	6¾ × 16¼ × 18⅛	40 lbs.	2995	Z-80A	8-Bit	64K-128K RAM 32K ROM

N/A = Not available

Disk Drive		Operating System	Hard Disk		Display Format	Color	Interface
Capacity	Size		Capacity	Size			
92K	5¼"	Proprietary	N/A	N/A	64×32	Yes	RS-232
322K	3½"	CP/M	5M	3 9/10"	80×25	No	RS-232; Parallel optional
2M	5¼"	Unix	5M–40M	3 9/10"	80×25	No	RS-232; Parallel optional
10M	5¼"	CP/M	10M	5¼"	80×24	No	RS-232; Parallel
655K	5¼"	CP/M; BB/M	10M–20M	5¼"	80×24	No	RS-232
376K per drive	5¼" or 8"	CP/M 2.2	10.32M	5¼"	80×24	No	RS-232; Parallel
1M	8"	6502	N/A	N/A	480×256 Pixels	No	RS-232; Parallel
640K	5¼"	CP/M	40M	5¼"	80×24	No	RS-232
322K	5¼"	MOS; CP/M	5M–20M	5¼"	80×24	No; EC 8800 Yes	RS-232; Parallel
1M per drive	8"	CP/M-86, MS-DOS, UCSD p-System	10M–20M	5¼"	80×25	Yes	RS-232; Parallel
655K	5¼"	CP/M 86; MS-DOS	10M	5¼"	80×25	Yes	RS-232; Parallel
360K	5¼"	CP/M; MS-DOS	10M	5¼"	80×25	No	RS-232; Parallel optional
500K	5¼"	Proprietary	18M–35M	5¼"	80×24	Yes	RS-232; Parallel optional
250K–2M	5¼"	System 88; CP/M 2.2	18M–140M	5¼"	64×16	No	RS-232; Parallel optional
760K	5¼"	Proprietary	18M–58M fixed 5M removable	5¼"–3 9/10"	80×26	Yes	RS-232; Parallel
700K	5¼"	CP/M	5M–10M	5¼"	80×24	Yes	RS-232; Parallel
1.2M	8"	CP/M or MP/M	15M internal; 30M external	5¼"	Configurable	No	RS-232; Parallel
800K each	5¼"	CP/M or MP/M	5M–20M	5¼"	80×24	No	RS-232; Parallel

***Suggested retail price**

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration	Memory Capacity
Quay Corporation	900 Series	7¾ × 17¾ × 22⅛	60 lbs.	3795	Z-80A	8-Bit	64K–128K RAM 32K ROM
Sage Computer Technology 4905 Energy Way Reno, NV 89502	Sage IV	6¼ × 12½ × 17	25 lbs.	3900	68000	16-Bit	256K–1M RAM 64K ROM
Sanyo Business Systems 51 Joseph St. Moonachie, NJ 07074	MBC 4000/4050	17⅜ × 12⅞ × 13⅔	50 lbs.	3295	8086; 8087 opt.	16-Bit	128K–512K RAM 4K ROM
SKS Computers 4091 Leap Road Hilliard, OH 43026	SKS 252 PICO	6½ × 18½ × 15⅝	20 lbs.	2595	Z-80A	8-Bit; 16-Bit opt.	80K–256K RAM 2K ROM
	SKS 4020	21¾ × 5¾ × 18½	46.2 lbs.	2995	Z-80A	8-Bit; 16-Bit opt.	128K–512K RAM 2K ROM
Smoke Signal 31336 Via Colinas Westlake Village, CA 91362	Chieftain	8 × 22	60 lbs.	3525	6809	8- or 16-Bit	64K–1M RAM 20K ROM
Tarbell Electronics 950 Dovlen Place, Suite B Carson, CA 90746	Rebel	17¾ × 7½ × 18½	40 lbs.	3777	Z-80	8-Bit	64K–1M RAM 32K ROM
Televideo Systems, Inc. 1170 Morse Ave. Sunnyvale, CA 94086	TS-802	13½ × 22½ × 14¼	44 lbs.	3495	Z-80A	8-Bit	64K RAM 4K ROM
	TS-1603	14½ × 18½ × 14½	52 lbs.	2995	8088	16-Bit	128K–256K RAM 4K ROM
Victor Technologies, Inc. 380 El Pueblo Road Scotts Valley, CA 95066	Victor 9000	18 × 19	49 lbs.	3995	8088	16-Bit	128K–896K RAM 4K ROM
Wang Laboratories, Inc. One Industrial Ave. Lowell, MA 01851	Wang Professional Computer	16½ × 14⅞ × 23⅛	27.8 lbs.	2595	8086	16-Bit	128K–640K RAM 8K ROM
Zenith Data Systems 1000 Milwaukee Ave. Glenview, IL 60025	Z-100 All-In-One	13½ × 19½ × 19½	50 lbs.	3599	8088/8085	8- or 16-Bit	128K–768K RAM 8K ROM

N/A = Not available

←*Monroe Systems' EC 8800 features a Z-80A microprocessor and 128K of RAM.*

←*Otrona's Attaché weighs only 19 pounds and measures 12×5¾×13⅜ inches.*

The Jonas C68000 has 16-bit configuration and runs on the unix operating system.→

Disk Drive		Operating System	Hard Disk		Display Format	Color	Interface
Capacity	Size		Capacity	Size			
1.25M	8"	CP/M; MP/M	33M	14"	80×24	No	RS-232; Parallel
640K	5¼"	UCSD p-System; CP/M	18M	5¼"	80×25	No	RS-232; Parallel
640K	5¼"	CP/M-86	5M-20M	5¼"	80×24	No	RS-232; Parallel
200K	3¼"	CP/M	N/A	N/A	80×24	No	RS-232; Parallel optional
560K	5¼"	MP/M	5M-10M	5¼"	N/A	No	RS-232; Parallel optional
250K-1M	8", 5¼"	DOS69; OS9-L1; OS9-L2; S-DOS	5M-600M	5¼"-14"	N/A	No	RS-232; Parallel optional
374K	5¼"	CP/M	28M	5¼"	N/A	No	RS-232; Parallel optional
500K	5¼"	CP/M	N/A	N/A	80×24	No	RS-232
1M	5¼"	CP/M-86; MS-DOS optional	N/A	N/A	80×24	No	RS-232 (2)
600 Single Side 1200 Double	5¼"	MS-DOS; CP/M-86	10M	5¼"	80×25	No	RS-232; Parallel
360K	3½"	MS-DOS 2.0	10M	5¼"	80×25	Yes	RS-232; Parallel
320K	5¼"	Z-DOS (16-Bit) CP/M (8-Bit)	10M	5¼"	80×24	Yes	RS-232; Parallel

•Suggested retail price

Debug Your Osborne Software

The Osborne 1 is known for the software that is bundled with it. However, some bugs in the programs combined with poor documentation have hindered the software's effectiveness. This article offers a few tips for getting the most from Osborne's software.

By Edward Mitchell

Osborne 1 software provides a host of functions that displays data on the video screen. However, a number of users have had difficulty using these functions due to poor documentation and bugs in the software.

The Osborne Video Display

The Osborne computer comes with a five-inch, 24-line by 52-character diagonal display. The screen is used to display a portion of the actual display area (Fig. 1); by pressing the control key and one of the directional arrow keys, the screen can be moved about on the 32-line by 128-character area. Alternately, programs can command the video display software to slide the screen window sideways or up or down.

The Osborne has a set of programmable display functions that delete, insert or underline characters, switch intensity levels and perform other operations. These functions are selected by printing an escape character (to activate the display processor) and then a control character (to select the desired function).

The escape code, an ASCII 27, signals to the software to process the next character as a screen command. The video display functions are summarized in Table 1. A few other commands are provided by printing different characters (shown in Table 1).

The Basic function CHR$(i) is used to output the character corresponding to ASCII code i. The ASCII code is the numeric value that the computer uses internally to represent characters. For example, ASCII 65 is used to store the letter A and ASCII 90 holds the letter Z. The Osborne uses ASCII 27 in a special way. Whenever your program tries to display an ASCII 27, the Osborne software intercepts the character and uses it as a request to use one of the display functions.

The next character output after the ASCII 27 selects the function to perform. For example, to make the Osborne underline all output, enter:

```
PRINT CHR$(27) + CHR$(108);
```

Thereafter, all of the characters displayed on the screen will be underlined. To turn off the underline mode, program:

```
PRINT CHR$(27) + CHR$(109);
```

Some functions are somewhat more difficult to use. For example, to position the cursor to an arbitrary (X, Y) location, you'll need to output:

```
PRINT CHR$(27) + CHR$(61) + CHR$(Y) + CHR$(X+32);
```

In this case, CHR$(61) selects the position cursor command and the two characters that follow indicate the exact position on the screen. Note that the X position is the value of X added to 32.

Several Osborne display functions are accessed by printing a single character. For example, to clear the screen, you type:

```
PRINT CHR$(26);
```

because ASCII 26 is the clear screen code.

Bugs in the Display Software

Unfortunately, the Osborne software has a few bugs and design flaws. For example, the position cursor function doesn't work correctly when Y equals 9. The upper left corner is at location (0,0); as Y increases, the cursor moves down the screen and as X increases, the cursor moves to the right. However, due to a bug in the Osborne software, when Y equals 9, the cursor always positions to the upper left corner on the screen.

One way to move the cursor to line 9 is to treat that line as a special case and to improvise. When Y is 9, position to (X, Y – 1) on the line above and then output a line feed character to drop the cursor down one line. In Basic-80, you would write:

```
IF Y< >9 THEN
    PRINT CHR$(27) + CHR$(61) + CHR$(Y)
    + CHR$(X+32);
ELSE
    PRINT CHR$(27) + CHR$(61) + CHR$(8)
    + CHR$(8) + CHR$(X+32) + CHR$(10);
```

where CHR$(10) outputs a line feed character.

Graphics Characters

Several problems occur in conjunction with the graphics characters. While the Osborne 1 does not support graphics, it does provide a set of graphics symbols. These are selected by printing:

```
CHR$(27) + "g"
```

The lowercase "g" activates the graphics mode. Thereafter, the ASCII codes from 0 through 31 select one of the 32 graphics characters.

Three problems were discovered with this scheme. First, CHR$(9) does not display a graphics character, but

Address correspondence to Edward Mitchell, 720-A Independence Ave., Mountain View, CA 94043.

instead displays the usual tab character, moving the cursor to the next horizontal tab stop. Second, none of the standard control characters, like line feed or carriage return, can be used unless the graphics mode is turned off. Otherwise, the control character appears as a graphics character.

Finally, the graphics code corresponding to ASCII 27 displays several graphics characters, possibly because the Osborne software is interpreting that character as another escape code rather than as a graphics character.

Another minor bug appears in the Osborne documentation concerning underlined characters. The reference manual says to print CHR$(27) + "1" to begin the display of underlined characters. The "1" is a misprint and should actually be a lowercase letter "L", as shown below:

```
PRINT CHR$(27) + "l"
```

The ASCII codes from 128 through 255 correspond to the codes from 0 through 127, but with the underscore character under each of them. They can be output directly by printing the appropriate ASCII code.

The reference guide also describes five commands that I was unable to use, perhaps because they were not adequately described, or because Microsoft Basic processes the characters before they get to the Osborne display software.

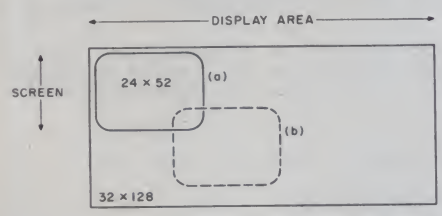

Fig. 1. The Osborne's 24-line by 52-column screen display is actually a window to a much larger screen area (32-line by 128-character). This "window" can be moved around on the larger display area as shown by a and b.

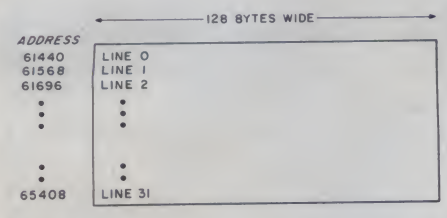

Fig. 2. The Osborne display memory layout. Each line occupies 128 bytes of memory, beginning at address 61440. The screen can be cleared by writing ASCII 32 (a space character) to every location in the memory.

Additionally, two functions are completely omitted from the reference guide: "disable" and "enable" keyboard input (see Table 1). The disable keyboard input function must be used with caution; the only way to enable input is to send the "enable code." Otherwise you must reset the computer and reload Basic.

The delete characters function seems to work in most cases, but it failed a test contained in a diagnostic program that I wrote to test each of the video display functions. The delete character test fills the screen with rows of asterisks. After restoring the cursor to the top of the screen, the test deletes each character on the top row. Then the cursor drops down to the next line on the screen and deletes those characters.

However the first character of the line below the one the cursor was on was also deleted during the test. In fact, at unpredictable times the cursor jumped to the left side of the screen for no apparent reason.

Using Direct Memory Address

Because the Osborne 1 uses a mem-

```
100 PRINT CHR$(26);       ' Clear Screen
110 PRINT CHR$(27)+"g"; ' Begin graphics display mode
120 FOR I=0 TO 31         ' Display all 32 graphics characters
130 PRINT CHR$(I);
140 NEXT I
150 PRINT CHR$(27)+"G"; ' End graphics display mode
160 PRINT
170 PRINT CHR$(27)+CHR$(41); ' Begin half intensity mode
180 PRINT "This line is displayed in half-intensity"
190 PRINT CHR$(27)+CHR$(40); ' End half intensity
200 FOR I=2 TO 20
210 PRINT CHR$(27)+CHR$(61)+CHR$(I)+CHR$(I+32)
          + "*"           ' Display slanting line of "*"
220 NEXT I
```

Example 1. Samples of how display functions are used.

```
10 REM - POKE SCREEN
20 REM - POKES AN ASTERISK CHARACTER INTO ALL OF SCREEN MEMORY
30 PRINT CHR$(26);        ' CLEAR SCREEN
40 FOR I%=-4096 TO -1
50 POKE I%, ASC("*")
60 NEXT I%
```

Example 2. A Basic program that fills the screen with asterisks by poking the asterisk character directly into memory.

ory-mapped display, programs can write directly to the memory display area. The Osborne allocates 4K bytes of memory (32 lines by 132 columns) to hold all of the text that appears on the screen.

The screen is filled with new characters by writing the ASCII codes into the screen memory area. The computer's hardware continuously reads the memory area and displays it on the screen. So, in essence, changing the contents of the memory instantly changes the data on the screen.

The memory-mapped display is kept in the highest 4K of memory. On the 64K Osborne, that memory is from address 61440 through 65535. Data can be displayed on the screen by writing directly to these memory locations with Basic-80's or CBasic's Poke statement, or by using a simple assembly-language program.

Writing directly to the memory area can be much faster than using CP/M's input-output calls or Basic's Print statement. In addition, direct memory access provides the flexibility to produce interesting graphics and animation sequences.

ASCII Codes	Description
27, 41	Begin half intensity mode
27, 40	End half intensity mode
27, 69	Insert a line at the current cursor position
27, 103	Begin graphics mode
27, 71	End graphics mode
27, 108	Begin underline characters
27, 109	End underline characters
27, 81	Insert a character at the current cursor position
27, 82	Delete the current line
27, 61, Y, X+32	Positions cursor at location (X, Y) on screen
27, 83, Y, X+32	Positions screen window at (X, Y) in display area
27, 84	Clear to the end of the current line
27, 87	Deletes the character at the position of the cursor

Undocumented Functions

27, 35	Disable all keyboard input
27, 34	Enable keyboard input

Other Functions

(The Escape code is not needed before sending these codes.)

7	Rings Bell
8	Move the cursor to the left one character
10	Line Feed
11	Vertical line feed
12	Move the cursor to the right one character position
13	Position cursor to left of current line
26	Clears the screen
30	Positions cursor to (0,0) on screen

Nonworking Functions from Basic

CONTROL 1	Brings screen display to home
CONTROL 2	Moves screen display to column 48
CONTROL 3	Moves screen display to column 102
CONTROL A	Scrolls the screen to the left
CONTROL B	Scrolls the screen to the right

Table 1. Osborne 1 video display commands. The functions described are programmed by printing the character codes shown on the left.

In the layout of the screen memory (Fig. 2), each line on the screen occupies 128 bytes. Line 0 on the screen appears at the address 61140 to 61567.

When programming in Basic, you'll probably want to use an integer for the address part of a Poke or Peek statement. In most Basics, integers in the range −32768 to +32767 are represented as "signed 2s complement" numbers. Numbers outside this range must be treated as real numbers. Most microcomputers perform integer arithmetic much faster than real numbers, so you'll want to use integers whenever possible.

The video display memory is at addresses 61440 to 65535, which is outside the range of integer numbers. But due to the manner in which integers are handled by the computer, negative integers in the range −4096 to −1 correspond with 61440 to 65535. Consequently, the following Peek statements are equivalent:

```
PEEK(61440) = PEEK (-4096)
```

The addresses can be converted by using the following formula:

```
An = A -65536
```

In this line, A is greater than 32767 but less than 65536, and An is the equivalent negative integer.

Astute readers will notice that the Peek statement can be used to read the data that is currently shown on the screen. Peek(−4096) returns the ASCII value of the character at location −4096.

Listing 1 shows how to position the cursor within the memory-mapped display area using a fast assembly-language program. The routine labeled "XYRAM" is a general-purpose subroutine that computes the memory address of any (X,Y) screen location. To use it, set B to the X value and C to the Y value. On return from the subroutine, the HL register pair holds the 16-bit real memory address of the location on the screen. If register A holds the character to write, then "MOV M,A" displays the character at the address contained in HL.

Generally, you should clear the screen before writing directly to the memory. Otherwise, your program's output may not appear where you are expecting to find it. As the lines on the screen scroll upwards, the memory address corresponding to line 0 changes.

One way to make the screen scroll is to shift all of the lines over one line position in memory. For example, line 1 would be copied to line 0, line 2 to line 1 and so on. A much easier way to do this is by having the operating system change the starting location of line 0. When the screen is made to scroll, the hardware just maps the next line in memory to the upper left corner of the screen. Consequently (depending on the previous scrolling of lines on the screen), you won't know just where line 0 begins unless the screen is first cleared.

```
100 REM - PRINTER
110 REM - DISPLAYS THE CONTENTS OF THE OSBORNE SCREEN ON THE PRINTER
120 REM - LANGUAGE: MBASIC (BASIC-80)
130 REM - NOTE: BEGINS DISPLAY AT SCREEN (0,0), NOT WINDOW (0,0)
140 LPRINT CHR$(15);     ' SET EPSON MX-80 TO 132 COLUMN PRINTOUT
150 FOR I%=-4096 TO -1 STEP 128
160 FOR J%=0 TO 127
170 LPRINT CHR$(PEEK(I%+J%));
180 NEXT J%
190 LPRINT
200 NEXT I%
210 END
```

Example 3. A simple program that copies a display to a printer.

Listing 1. A program that positions the cursor within the memory-mapped display area.

```
; DEMONSTRATION OF DIRECT MEMORY-MAPPED VIDEO DISPLAY
; ON THE OSBORNE I PORTABLE COMPUTER.
; WRITTEN IN 8080 ASSEMBLY LANGUAGE (CP/M ASSEMBLER)
; EDW. MITCHELL, 05/30/82
;
BOOT    EQU     0
BDOS    EQU     5

        ORG     0100H

START:  LXI     SP,STACK; SET UP STACK POINTER
        MVI     E,26    ; CLEAR SCREEN CODE
        MVI     C,2     ; WRITE CHAR. FUNCTION
        CALL    BDOS    ; OUTPUT THE CLEAR SCREEN CODE
        MVI     B,0     ; INITIALIZE X=0, (B REG. HOLDS X)
        MVI     C,0     ; INITIALIZE Y=0, (C REG. HOLDS Y)

LOOP:   CALL    XYRAM   ; COMPUTE LOCATION TO WRITE CHAR.
        MVI     M,'*'   ; OUTPUT A CHARACTER
        INR     B       ; POINT TO NEXT X VALUE
        MOV     A,B
        CPI     128     ; SEE IF DONE YET
        JNZ     LOOP    ; KEEP LOOPING UNTIL X=128
        MVI     B,0     ; CLEAR X BACK TO 0
        INR     C       ; INCREMENT Y VALUE
        MOV     A,C
        CPI     22      ; CHECK FOR BOTTOM OF SCREEN
        JNZ     LOOP
        JMP     BOOT    ; RETURN TO CP/M WHEN ALL FINISHED

XYRAM:  ; COMPUTE CURSOR LOCATION IN VIDEO RAM AREA
        ; ON ENTRY:  B=X LOCATION,      C=Y LOCATION
        ; ON RETURN:  HL=16 BIT ADDRESS OF THE (X,Y) SCREEN
        ;             POSITION IN THE VIDEO RAM AREA
        ; CAUTION:  THIS ROUTINE DOES NOT PRESERVE THE STATE OF ANY
        ;           REGISTERS NOR DOES IT CHECK TO SEE THAT B/C HOLD
        ;           VALID VALUES.  IT IS QUITE POSSIBLE TO JUMP OFF THE
        ;           EDGE OF THE SCREEN AND WHO KNOWS WHAT COULD HAPPEN.

        MOV     A,C     ; LOAD THE Y VALUE
        RLC             ; MULTIPLY BY 2 TO GIVE OFFSET INTO TABLE
        MVI     H,0     ; SET HL=Y*2
        MOV     L,A     ; Y IS IN 0..32, SO Y*2 IS IN 0..64
        XCHG            ; TEMPORARILY SAVE IN DE
        LXI     H,TABLE ; GET ADDRESS OF OFFSET TABLE
        DAD     D       ; ADD Y*2 TO TABLE ADDRESS
```

More →

Animated Displays

The Osborne's video display system provides enough flexibility to draw "flicker-free" animated sequences. On many computers, an animated sequence is output by drawing a scene and then rapidly drawing the next scene. Unfortunately, that type of animation causes flickering.

A better method is to draw a frame of the animation in a separate, undisplayed memory area; then, switch the display instantly to show the new scene.

Because the Osborne's memory display area is much larger than the screen area, it is possible to draw pictures in one section of the screen memory and then rapidly position the

screen to display that section of memory. By drawing the pictures directly into the screen memory and alternating between the two areas of memory using the "position screen window" function (see Table 1), animation is easy.

Listing 2 shows a simple CBasic program that "bounces" an animated ball around on the screen. The program displays a group of "0" characters that represent a ball. Initially, the ball starts at the upper left corner of the screen, moving downwards and to the right. When it hits the bottom of the screen, it bounces upwards.

Similarly, when it runs into the right side of the screen, it rebounds toward the left. Typing any of the arrow keys speeds the motion of the ball in the direction indicated by the arrow. Typing control-C exits the program.

Other Undocumented Features

The Osborne contains a set of primitive diagnostic routines that are built into the system's Read Only Memory (ROM) area. When the system is powered up, or after the reset button is pressed, the screen displays the following:

Insert disk in Drive A and press Return

Listing 1 continued.

```
        MOV     E,M     ; LOAD THE ADDRESS OF ROW Y
        INX     H       ; POINT TO NEXT BYTE
        MOV     D,M     ; DE HOLDS THE ROW ADDRESS
        XCHG            ; PUT ROW ADDRESS IN HL AND X TO IT
        MVI     D,0     ; PUT X IN DE REGISTER PAIR
        MOV     E,B     ;
        DAD     D       ; ADD X TO ROW ADDRESS IN HL
        RET             ; RETURN WITH HL HOLDING THE BYTE ADDRESS

                ; THE FOLLOWING TABLE HOLDS THE ADDRESS OF EACH ROW ON
                ; THE DISPLAY.  ENTRY # 0 IS ROW 0, ENTRY 1 IS ROW 1.
                ; VIDEO RAM OCCUPIES 4K MEMORY BEGINNING AT 0F000H
TABLE:  DW      0F000H  ; ADDRESS OF LINE 0
        DW      0F080H
        DW      0F100H
        DW      0F180H
        DW      0F200H
        DW      0F280H
        DW      0F300H
        DW      0F380H
        DW      0F400H
        DW      0F480H
        DW      0F500H
        DW      0F580H
        DW      0F600H
        DW      0F680H
        DW      0F700H
        DW      0F780H
        DW      0F800H
        DW      0F880H
        DW      0F900H
        DW      0F980H
        DW      0FA00H
        DW      0FA80H
        DW      0FB00H
        DW      0FB80H

STACK:  EQU     $+128

        END
```

After pressing Return, the Osborne reads in CP/M from the diskette in drive A.

If you press control-D instead of Return, the display switches to the diagnostics menu shown in Fig. 3. Four options are shown:

- Pressing the D key performs a disk drive check.
- The K key tests the keyboard and the video display.
- The M key tests system memory.
- The R reads a test program from a disk.

ROM DIAGNOSTICS
Select Test:
A, B Boot Sys
D isk
K ey-vdt
M emory
R ead in test

:

Fig. 3. The Osborne contains a set of built-in diagnostic routines that are selected by pressing control-D at the "Insert disk in Drive A and press Return" prompt at system start-up. To select a test, enter one of the letters shown at the left of the menu. You can also boot from either drive A or drive B by pressing one of those keys.

For option D, use a blank formatted diskette. With option K, the keyboard test has you press keys on the keyboard. As a key is struck, the corresponding character is displayed on the screen. Memory is tested by repeatedly writing the values 0 through 255 into all of memory. Press reset to stop the test.

Another hidden option is available

Listing 2. A CBasic program that bounces an animated ball around on the screen.

```
REM - BOUNCE
REM - DEMONSTRATES SIMPLE ANIMATION BY BOUNCING A
REM - BALL AROUND ON THE OSBORNE SCREEN
REM - BY EDW. MITCHELL, 05/30/82
REM - LANGUAGE: CBASIC

DIM SCRADDR%(1)
        REM - ADDRESS OF 'SCREEN 0' AND 'SCREEN 1'

DEF FN.DRAWBALL% (SCRNUM%, X%, Y%)
  REM - DRAW A BALL IN 'SCRNUM%' AT COORDINATES X AND Y
  XBASE%=SCRADDR%(SCRNUM%)
  RESTORE
  REM - READ EACH OF THE 12 COORDINATES FOR THE BALL AND OUTPUT
  REM - A "O" FOR EACH POSITION, THEREBY DRAWING THE BALL
  FOR I%=1 TO 12
    READ X1%, Y1%
    REM - WRITE DIRECTLY TO MEMORY-MAPPED DISPLAY AREA
    POKE XBASE% + (Y% + Y1%) * 128 + X% + X1%, 48
  NEXT I%
  RETURN
FEND

DEF FN.ERASEBALL% ( SCRNUM%, X%, Y% )
  REM - ERASES BALL FROM 'SCRNUM%' BY OVERWRITING IT WITH SPACES
  XBASE%=SCRADDR%(SCRNUM%)
  RESTORE
  FOR I%=1 TO 12
    READ X1%, Y1%
    POKE XBASE% + (Y% + Y1%) * 128 + X% + X1%, 32
  NEXT I%
  RETURN
```

More →

Listing 2 continued.

```
FEND

DEF FN.SHOW% ( SCRNUM% )
  IF SCRNUM% = 0 THEN PRINT CHR$(27)+CHR$(83)+CHR$(0)+CHR$(32); \
  ELSE \
    PRINT CHR$(27)+CHR$(83)+CHR$(0)+CHR$(32+64)
  RETURN
FEND

REM - INITIALIZE LOCATION OF THE TWO SCREEN AREAS
SCRADDR%(0) = -4096
SCRADDR%(1) = -4096 + 64

REM - SET INITIALIZE X AND Y SPEEDS
DX% = 1
DY% = 1

REM - SET STARTING COORDINATES OF THE BALL
X%=0
Y%=0

REM - SET THE RIGHT EDGE AND BOTTOM SIDE OF THE SCREEN
XEDGE%=48
YEDGE%=19

REM - INITIAL SCREEN SELECTION
SCREEN% = 0

REM - ASCII CODES FOR ARROW KEYS
LEFTARROW% = 8
RIGHTARROW% = 12
UPARROW% = 11
DOWNARROW% = 10

REM - USES A 'CTRL/C' TO EXIT THE PROGRAM
EXITPROGRAM% = 3

REM - MAIN LOOP, CLEAR SCREEN FIRST
PRINT CHR$(26);

WHILE 1=1 : REM - LOOP FOREVER
  I% = FN.DRAWBALL% ( SCREEN%, X%, Y%)
  I% = FN.SHOW% ( SCREEN% )

  REM - FLIP SCREEN SELECTION
  SCREEN% = 1 - SCREEN%

  REM - ERASE BALL ON 'OTHER' SCREEN
  I% = FN.ERASEBALL% ( SCREEN%, LASTX%, LASTY% )

  REM - SAVE COORDINATES OF BALL ON SCREEN FOR 'ERASE'
  LASTX% = X%
  LASTY% = Y%

  REM - SEE IF ANY CHARACTERS ENTERED
  IF CONSTAT%=0 THEN 100
    C% = CONCHAR%
    IF C% = LEFTARROW% THEN DX% = DX% - 1 \
      ELSE
    IF C% = RIGHTARROW% THEN DX% = DX% + 1 \
      ELSE
    IF C% = UPARROW% THEN DY% = DY% - 1 \
      ELSE
    IF C% = DOWNARROW% THEN DY% = DY% + 1 \
      ELSE
    IF C% = EXITPROGRAM% THEN GOTO 200


100
  REM - MOVE BALL TO NEXT LOCATION
  X% = X% + DX%
  Y% = Y% + DY%

  IF X% > XEDGE% THEN DX% = -DX% : X% = X% + DX% \
    ELSE
      IF X% < 0 THEN DX% = -DX% : X% = X% + DX%

  IF Y% > YEDGE% THEN DY% = -DY% : Y% = Y% + DY% \
      ELSE
        IF Y% < 0 THEN DY% = -DY% : Y% = Y% + DY%
  WEND

  200      REM - END OF PROGRAM


  REM - COORDINATES OF A BALL ON A 4 BY 4 GRID
  DATA     0,1,     0,2,     1,0,     1,1,     1,2
  DATA     1,3,     2,0,     2,1,     2,2,     2,3
  DATA     3,1,     3,2

  END
```

at the "Insert disk in Drive A" prompt. Pressing the double quote key causes the Osborne to boot from drive B instead of drive A. Thereafter, it *thinks* that drive B is drive A.

To boot from drive B, place your CP/M system disk in drive B. Press reset and then press the double quote key. The system boots from the drive on the right. Once CP/M is loaded, the A prompt appears and the disk names are reversed.

Conclusion

The Osborne 1 video system supports a full-function display interface and an especially unique scrolling screen that acts as a window to a much larger display area. Despite minor bugs, the display software is easily used from Basic, CBasic and assembly language. And since the Osborne uses a memory-mapped display, interesting animation effects are easily programmed.

> The Osborne 1 is still nearly uncontested as the lowest-cost word and data processing system.

WordStar, the word processing system available with the Osborne, makes an occasional line-positioning error. It's possible that WordStar has bugs, but more than likely, the problems are due to the bugs in the Osborne's cursor-positioning software.

I ran a simple diagnostic program to test the Osborne's display interface on both my Osborne computer and on several machines at a local computer dealer. All of the machines had the same results.

To determine if the problem was due to peculiarities in the programming-language processors (for example, Basic-80), I wrote some of the routines in both CBasic and assembly language. All of the tests were performed in the same (albeit sometimes incorrect) manner.

Bugs in a new computer system are not unusual. For example, the IBM Personal Computer suffers from a widely publicized glitch in its printout of numeric values.

Even with the video display problems, the Osborne 1 is still nearly uncontested as the lowest-cost word and data processing system. And it really is portable!■

WAYNE GREEN BOOKS

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by George Young and Peter Stark

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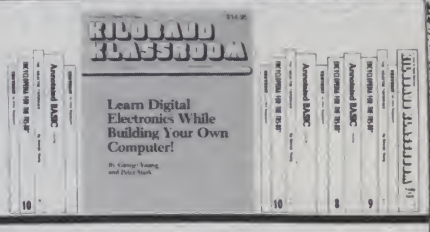
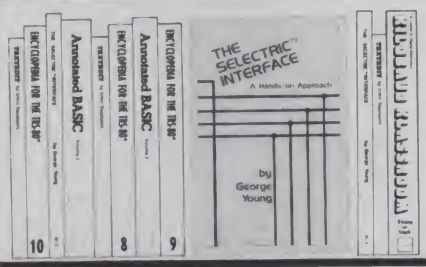


THE SELECTRIC INTERFACE by George Young



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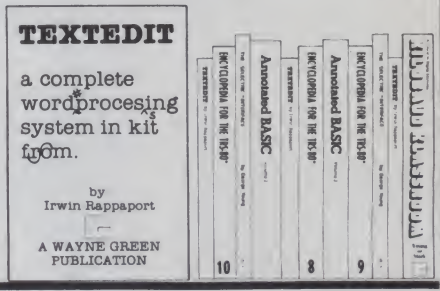

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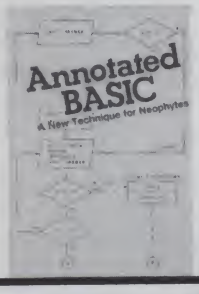

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Seeking a Cheap Output?

This article describes how to construct your own simple and inexpensive output line. The project is ideal for low-end micro owners whose computers lack output ports.

By Penn Clower and Paul Calabraro

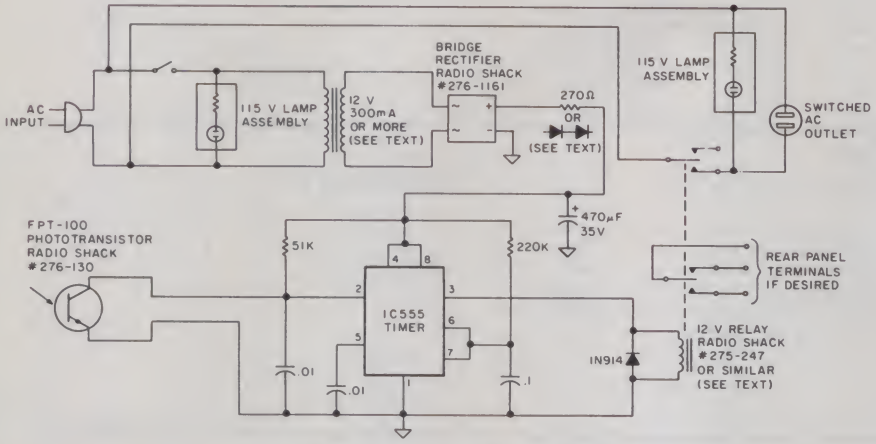
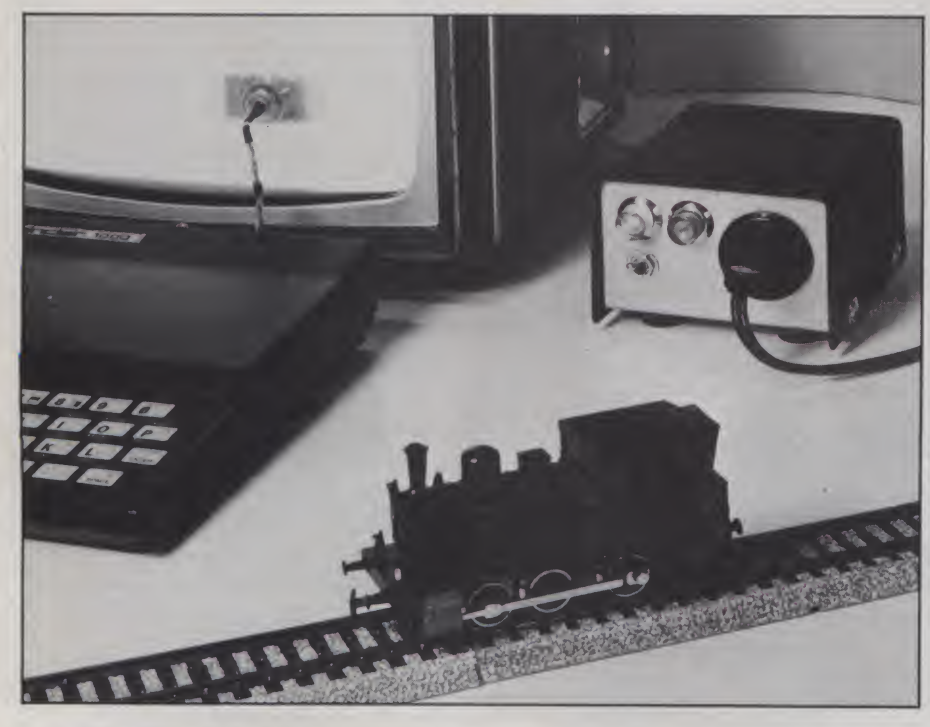


Fig. 1. Schematic diagram of this simple output.



Wanna start something? Let your computer do the work with this inexpensive, no risk attachment.

Here's an easy way to add an output line to your home computer. The method involves only one bit and, although it's not fast by computer standards, it is simple (one IC) and inexpensive (less than $30 for the fancy version, about $3 for the basic circuit alone) and works well. Best of all, it doesn't require any electrical connection to the computer itself—and that means no warranty problems!

How It Works

The trick is to use a phototransistor held to the display screen with a suction cup, while the computer flashes a square on and off underneath the transistor to control the output. In the unit we use, the output is taken from a relay. One set of contacts switches a front panel ac outlet, while another is available on the rear panel as an SPDT switch.

For a TTL-compatible output, you can slightly modify the circuit and power it from a 5 V supply. You can even wire together several copies of the basic inexpensive circuit to make a crude multiple bit D/A converter.

Who Needs It?

You do...particularly if you own one of the new low-cost micros, such as the Timex/Sinclair. Like several of the less expensive computers, the basic T/S-1000 machine does not come with electrical output ports. It's an excellent tool for learning programming, but what if you want to do something

Address correspondence to Penn Clower, 459 Lowell St., Andover, MA 01810, or Paul Calabraro, 39 Cottage St., Stoneham, MA 02180.

besides run on-screen programs?

With this output line your micro can flash lights, control small appliances, run electric trains and do any number of real-world things. For example, your micro can now ring a bell to signal the end of a long numerical calculation. This simple output is a cheap no-risk alternative to a real output circuit. The circuit also makes an excellent learning aid for children, because they can actually *see* the interface working.

The Circuit

The circuit, shown in Fig. 1, contains little more than the phototransistor, 555 timer and output relay. The timer provides several important features, including a high input impedance that doesn't load down the sensor and a regenerative circuit that ensures that the output will have nice, clean digital transitions regardless of how noisy the analog input signal is. That's particularly important when the 555 is used to drive other logic directly. The timer function is also necessary to fill in between the CRT frame intervals.

Although the picture on your monitor may *look* like it's there all the time, the display is actually being updated 60 times a second. Once triggered, the timer is set to stay on for about 25 ms. With a 60 Hz video input, the 555 output is high for about 80 percent of the time, which is sufficient to operate the relay.

The circuits of Fig. 2 can be used to provide a clean non-pulsed digital output. In Fig. 2a, a second 555 (or more likely, the second half of a 556 dual timer) has been added to completely fill in between the output pulses. In Fig. 2b, a 7474 flip-flop has been added to provide a latched switch-on, switch-off function. The circuits will draw less than 15 mA from a 5-volt supply, so in most cases that power can be taken from an existing source.

The phototransistor works just like a normal transistor except that an optical input, instead of an electrical one, is used to control the base. Actually, the Radio Shack phototransistor also has a base terminal, but it isn't used, so we carefully insulated it to prevent electrical contact.

When the transistor is illuminated, it draws collector current, the collector voltage drops, and the 555 input gets triggered. The 51k resistor shown provided ample sensitivity for our setup, but you can increase or decrease the resistance to get more or less sensitivity as needed.

The basic circuit will work with any power supply voltage between 5 and 15, and the 555 output by itself is capable of sourcing or sinking up to 200 mA. We had a 12 V relay with DPDT 3 amp contacts and a sensitive (only 20 mA to operate) coil. That relatively light load is easy to drive with the small Radio Shack #273-1385 transistor, which is also a good match for the Radio Shack #275-247 relay. But since that relay has only one set of contacts, you will have to give up the second set of switched connections that is shown in Fig. 1.

Another possibility is to use the larger Radio Shack #275-206 or #275-214 relays with their multiple contacts. We experimented with various power transformers for driving these relays (the transformer in our unit has been rewound several times!) and found that reliable operation requires that you use the larger 12 V, 1.2 amp transformers and that you replace the 270 ohm resistor in the power supply with two 1 amp 50 PIV (peak inverse voltage) diodes connected in series. That means a larger box is required, so you may decide that the extra contacts aren't worth the expense.

Construction

You can get the parts—with the exception of the suction cup—to build this simple output at Radio Shack. The unit just fits inside the Shack's 3¼ × 2⅛ × 4-inch metal cabinet. If you use the sensitive relay, then you can save some room by using the 300 mA size transformer instead of the larger one we used.

The transformer and circuit board are mounted on two 3/16 × ½ inch screws protruding into the box from

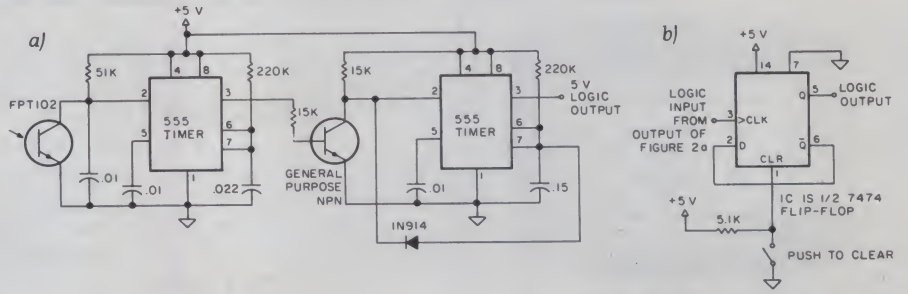
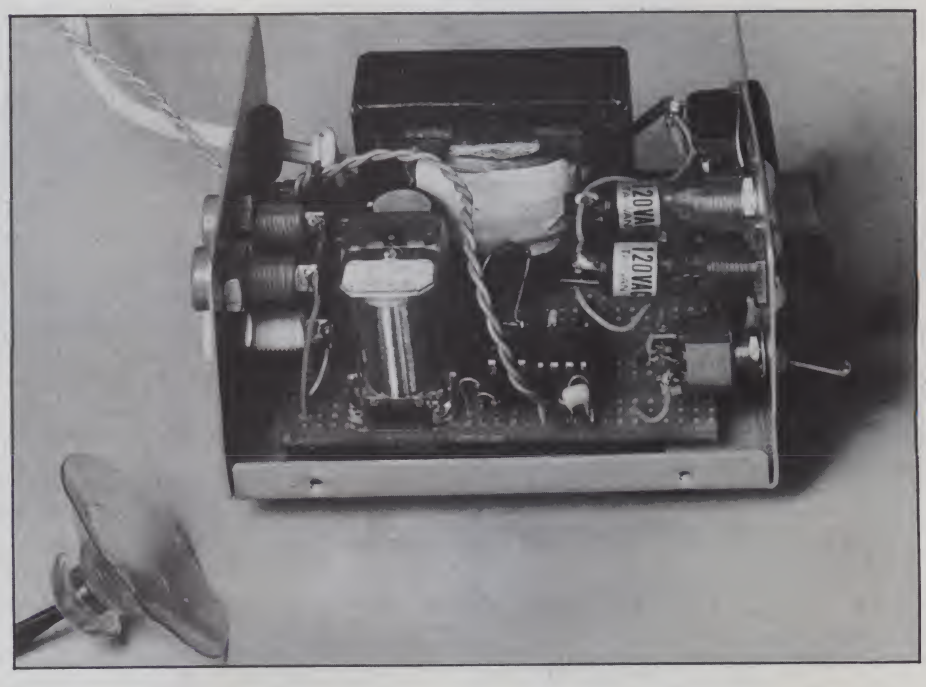


Fig. 2. Simple modifications for driving 5-volt logic with this simple output. Fig. a. shows a second 555 added to change the pulsed output to a steady logic level. Fig. b. shows one-half a 7474 flip-flop added to create a switch-on, switch-off function.



Most of the box is filled with the power transformer and relay. The few remaining components occupy the space in and around a single 14-pin DIP socket.

the bottom. First position the transformer along the right side of the box, making sure to allow room behind the front panel for the ac outlet. Mark and drill the two transformer mounting holes. Run the screws through these holes from the chassis bottom and hold them in place with $\frac{3}{16}$ nuts.

When you're ready for the final assembly, slide the transformer over these screws, followed by the circuit board, and finally two more nuts to hold everything in place. This arrangement is neat and keeps the bottom of the circuit board about 1/8 inch away from the bottom of the box.

> This output is . . . an easy weekend project that provides a safe, convenient output line for any computer capable of driving a CRT.

As an extra precaution against shorts, cover the bottom plate area underneath the circuit board with electrical tape and be sure to check the final position of all 110 V ac wiring.

Cut the circuit board into a rectangle that's about 1½ × 3 inches. Our board has two protruding tabs that fit on either side of the transformer and holes that fit over the mounting screws. The circuit board is similar to a Radio Shack product called grid board.

With an array of drilled holes and isolated PC pads, it's easy to use for small projects. Parts are mounted from the unplated side and soldered to the pads; interconnections are then made from the bottom of the board with short lengths of soldered wire.

There is plenty of room on top of the board for the few components. Be sure to allow ample clearance for the front and rear panel hardware, and watch out for the possibility of shorting something with the screws that hold the rubber feet to the bottom of the box. A single 14-pin DIP socket holds both the 555 timer and rectifier bridge package. The placement of the remaining parts is pretty clear from the photographs. Some of our parts weren't purchased at Radio Shack, so your board will look a little different, but fitting things in shouldn't really be a problem.

The suction cup mount is easy to make. The clear rubber suction cup is sold as a window support for stained glass trinkets and comes with a small metal hook screwed in its back. Hardware stores often stock them, and craft or hobby shops are also likely sources. As a last resort, you might try mail-order gift firms that specialize in small items.

Remove the hook and drill a hole slightly smaller than the transistor diameter (I used a #19 drill) *almost* all the way through the cup. Be sure to check the drill diameter by putting some holes in scrap wood, and measure the thickness of the suction cup carefully to avoid drilling through it! A drill press makes the operation easy.

Cut the base lead off the transistor and insulate the stub with a drop of epoxy glue. Solder about three feet of color-coded twisted wire to the collector and emitter leads, insulating the connection with spaghetti or shrink tubing. Put a drop of salad oil into the hole in the suction cup (to improve the optical coupling) and push in the phototransistor. That's all there is to it!

Checkout and Use

Check the wiring carefully before plugging the unit in. Note that the ac indicator comes on when the power switch is thrown. Now face the suction cup towards a light source (several feet from a 40 watt bulb should do). The relay should click and the outlet indicator lamp will come on. You can also stick the cup to the front of a small TV set; the relay should open and close as the picture moves beneath the phototransistor. You may have to adjust the brightness and contrast controls, but not enough to make the picture-viewing uncomfortable.

When used with a computer, the output is normally switched by controlling an area about 3/8 inch square beneath the phototransistor. Our CRT did not need to be adjusted except for normal viewing. Of course "normal" is a function of habit and the size and age of the monitor, so you might have to do some tweaking. Our computer writes dark characters on a white background. This inverts the control polarity, but it is easily accommodated in software.

Despite its simplicity, this output is a useful accessory. It's an easy weekend project that provides a safe, convenient output line for any computer capable of driving a CRT. Since there's no warranty-voiding modification to the computer, the project is an excellent one for the first-time owner!■

CONVERSIONS "I"

Each month Microcomputing *will publish translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

Cross-Reference program (March 1983 Microcomputing*) converted to run on the IBM PC. By Mohammad Dadseresht, 11360 Iowa Ave. #103, Los Angeles, CA 90025.*

```
1000 'This program is a cross-reference generator that
1010 'prints a list of all variables and referenced
1020 'line numbers along with the line number in which
1030 'these variables are used.
1040 '
1050 'Original program was written by James Monagan in
1060 'March 1983 issue of MICROCOMPUTING, pages 110-112.
1070 '
1080 'Modified for IBM-PC by:
1090 '           Mohammad Dadseresht
1100 '           11360 Iowa Ave. #103
1110 '           Los Angeles, CA 90025
1120 'March 16, 1983
1130 '
1140 '
1150 CLS: KEY OFF
1160 SC=500
1170 SK=91                'ASCII equivalent of '[' (higher than Z)
1180 SN=SK-26             'ASCII equivalent of 'A'
1190 SA=SN+1-ASC("A")
1200 DIM RWS$(200), PT%(26)
1210 DIM VNXT%(SC+SK), V$(SC+SK), FRST%(SC), LST%(SC)
1220 DIM RFL%(5*SC), NXT%(5*SC)
1230 '
1240 'RESERVED WORDS
1250 '
1260 DATA ABS,AND,ASC,AS,ATN,AUTO,BEEP,BLOAD,BSAVE
1270 DATA CALL,CDBL,CHAIN,CHR$,CINT,CIRCLE,CLEAR,CLOSE,CLS
1280 DATA COLOR,COM,COMMON,CONT,COS,CSNG,CSRLIN,CVD,CVI,CVS
1290 DATA DATA,DATE$,DEF,DEFDBL,DEFINT,DEFSNG,DEFSTR,DELETE,DIM,DRAW
1300 DATA EDIT,ELSE,END,EOF,EQV,ERASE,ERL,ERR,ERROR,EXP
1310 DATA FIELD,FILES,FIX,FN,FOR,FRE,GET,GOSUB,GOTO,HEX$
1320 DATA IF,IMP,INKEY$,INP,INPUT,INSTR,INT,KEY,KILL
1330 DATA LEFT$,LEN,LET,LINE,LIST,LLIST
1340 DATA LOAD,LOC,LOCATE,LOF,LOG,LPOS,LPRINT,LSET
1350 DATA MERGE,MID$,MKD$,MKI$,MKS$,MOD,MOTOR,NAME,NEW,NEXT,NOT
1360 DATA OCT$,OFF,ON,OPEN,OPTION,OR,OUT
1370 DATA PAINT,PEEK,PEN,PLAY,POINT,POKE,POS,PRESET,PRINT,PSET,PUT
1380 DATA RANDOMIZE,READ,REM,RENUM,RESET,RESTORE,RESUME,RETURN
1390 DATA RIGHT$,RND,RSET,RUN
1400 DATA SAVE,SCREEN,SGN,SIN,SOUND,SPACE$,SPC
1410 DATA SQR,STEP,STICK,STOP,STR$,STRIG,STRING$,SWAP,SYSTEM
1420 DATA TAB,TAN,THEN,TIME$,TO,TROFF,TRON
1430 DATA USING,USR,VAL,VARPTR,VARPTR$,WAIT,WEND,WHILE,WIDTH,WRITE,XOR,"[",$
1440 FF$=CHR$(12)
1450 SSS$=STRING$(76,"-")
1460 PAGE.LNG=56
1470 COL.TOTAL=6
1480 PRINT: INPUT "SOURCE FILE NAME (WITH EXTENSION) ";IFILE$
1490 IF IFILE$="" THEN END
1500 RW=0
1510 READ RW$
1520 WHILE (RW$<>"$")
1530   RW=RW+1
1540   RWS$(RW)=RW$
1550   I=ASC(RW$)-ASC("A")
1560   IF PT%(I)=0 THEN PT%(I)=RW
1570   READ RW$
1580 WEND
1590 FOR I=0 TO 26
1600   IF PT%(I)=0 THEN PT%(I)=RW
1610 NEXT I
1620 VC=SK: RC=-1
1630 FOR I=0 TO SK
1640   VNXT%(I)=-1
1650 NEXT I
1660 GOSUB 1720
1670 GOSUB 2880
1680 END
1690 '
1700 '*************** Input routine
1710 '
1720 OPEN IFILE$ FOR INPUT AS #1
1730 IFILE.END=1: LINE.TOTAL=0
1740 WHILE (IFILE.END)
1750   IF EOF(1) THEN IFILE.END=0: GOTO 1870
1760   LINE INPUT #1,L$
1770   LG=LEN(L$): BRNCH=0: LINE.TOTAL=LINE.TOTAL+1
1780   LP=1
1790   LN$="": BLANK=0
1800   WHILE (BLANK=0)
1810     IF MID$(L$,LP,1)=" " OR MID$(L$,LP,1)=CHR$(9) THEN
         BLANK=1: GOTO 1840
1820     LN$=LN$+MID$(L$,LP,1)
1830     LP=LP+1
1840   WEND
1850 LN=VAL(LN$)
1860 PRINT "SCANNING LINE NUMBER: ";LN: GOSUB 1920
1870 WEND
1880 RETURN
1890 '
1900 '*************** Line parser
1910 '
1920 V$="": C$=""
1930 WHILE (LP<LG)
1940   LP=LP+1
1950   C$=MID$(L$,LP,1)
1960   IF C$>="a" AND C$<="z" THEN C$=CHR$(ASC(C$)-32)
1970   IF C$< "A" OR  C$> "Z" THEN GOTO 2000
1980   IF VAL(V$)>0 AND VAL(V$)=VAL(V$+MID$(L$,LP,255)) THEN GOSUB 2540
1990   V$=V$+C$: GOTO 2090
2000   IF C$>="0" AND C$<="9" THEN IF V$>"" OR BRNCH>0 THEN
         V$=V$+C$: GOTO 2090
2010   IF C$ =" " OR  C$ =CHR$(9) THEN GOSUB 2290: GOTO 2090
2020   IF C$ ="." AND V$>"" THEN V$=V$+C$: GOTO 2090
2030   IF C$ ="?" THEN RETURN
2040   IF C$<>"." THEN BRNCH=0
2050   IF C$ ="$" OR C$ ="%" THEN IF V$<>"" THEN V$=V$+C$
2060   IF C$ =CHR$(34) THEN GOSUB 2290: LP=INSTR(LP+1,L$,C$)
2070   IF LP=0 THEN RETURN
2080   GOSUB 2290
2090 WEND
2100 GOSUB 2290
2110 RETURN
2120 '
2130 '*************** Is symbol (V$) in the table ?
2140 '
2150 C=ASC(V$)
2160 P=PT%(C-ASC("A"))
2170 BRNCH=0: RW$=""
2180 WHILE(P<=RW)
2190   IF C<ASC(RWS$(P)) THEN RETURN
2200   IF V$<>RWS$(P) THEN P=P+1 ELSE P=RW+1
2210 WEND
2220 RW$=V$
2230 IF V$="DATA" OR V$="REM" OR V$="REMARK" THEN LP=LG+1: RETURN
2240 IF V$="GOTO" OR V$="GOSUB" OR V$="THEN" THEN BRNCH=1
2250 RETURN
2260 '
2270 '*************** Symbol (v$) is the name of a variable
2280 '
2290 IF V$="" THEN RETURN
2300 IF ASC(V$)<ASC("A") THEN GOSUB 2410: V$="": RETURN
2310 GOSUB 2150
2320 IF RW$>"" THEN V$="": RETURN
2330 IF C$="(" THEN V$=V$+C$
2340 C=ASC(V$)+SA: IL=-1: I=C
2350 GOSUB 2540
2360 V$=""
2370 RETURN
2380 '
2390 '*************** Symbol (V$) is a line number
2400 '
2410 IF VAL(V$)<1000 THEN C=INT(VAL(V$)/100)
                     ELSE C=9+INT(VAL(V$)/1000)
2420 IF C>SN THEN C=SN
2430 IL=-1: I=C
2440 WHILE (I>=0)
2450   IF VAL(V$)<=VAL(V$(I)) THEN GOSUB 2640: RETURN
2460   IL=I: I=VNXT%(I)
2470   WEND
2480 GOSUB 2760
2490 V$=""
2500 RETURN
2510 '
2520 '***************
2530 '
2540 WHILE (I>=0)
2550   IF LEFT$(V$+"              ",12)<=
         LEFT$(V$(I)+"              ",12) THEN GOSUB 2640: RETURN
2560   IL=I: I=VNXT%(I)
2570 WEND
2580 GOSUB 2760
2590 V$=""
2600 RETURN
2610 '
2620 '***************
2630 '
2640 IF V$<>V$(I) THEN GOSUB 2760: RETURN
2650 J=LST%(I-SK)
2660 IF RFL%(J)=LN THEN V$="": RETURN
2670 RC=RC+1
2680 NXT%(J)=RC
2690 RFL%(RC)=LN
2700 NXT%(RC)=-1
2710 LST%(I-SK)=RC
2720 RETURN
2730 '
2740 '***************
2750 '
2760 VC=VC+1
2770 IF IL>=0 THEN VNXT%(IL)=VC
2780 V$(VC)=V$
2790 VNXT%(VC)=I: RC=RC+1
2800 FRST%(VC-SK)=RC: I=VC
2810 RFL%(RC)=LN
2820 NXT%(RC)=-1
2830 LST%(I-SK)=RC
2840 V$="": RETURN
2850 '
2860 '*************** Print routine
2870 '
2880 PZ=0: GOSUB 3140
2890 FOR J=0 TO SK
2900   V=VNXT%(J)
2910   IF V<0 THEN GOTO 3100
2920   WHILE (V>=0)
2930     IF LZ>PAGE.LNG THEN GOSUB 3140: GOTO 2970
2940     NEW.CHAR$=MID$(V$(V),1,1)
2950     IF SORT.CHAR$="" THEN SORT.CHAR$=NEW.CHAR$
2960     IF NEW.CHAR$<>SORT.CHAR$ THEN GOSUB 3150
2970     RZ=0: I=FRST%(V-SK): LPRINT V$(V);
2980     WHILE (I>=0)
2990       IF RZ=0 THEN LPRINT TAB(16);
3000         LPRINT USING "     ######"; RFL%(I);
3010       RZ=RZ+1
3020       IF RZ<COL.TOTAL THEN 3050
3030       RZ=0: LPRINT : LZ=LZ+1
3040       IF LZ>PAGE.LNG THEN GOSUB 3140
3050       I=NXT%(I)
3060     WEND
3070     IF RZ>0 THEN LPRINT : LZ=LZ+1
3080     V=VNXT%(V)
3090   WEND
3100 NEXT J
3110 LPRINT SSS$
3120 LPRINT "LINES:";LINE.TOTAL;"  SYMBOLS:";VC-SK;"  REFERENCES";RC+1
3130 LPRINT FF$: RETURN
3140 GOSUB 3160: LPRINT "SYMBOL";TAB(20);"REFERENCE LINE";LZ=LZ+1
3150 LPRINT SSS$: LZ=LZ+1: SORT.CHAR$=NEW.CHAR$: RETURN
3160 IF PZ>0 THEN LPRINT FF$
3170 PZ=PZ+1: LPRINT TAB(72); "PG#";PZ
3180 LPRINT
3190 LZ=3: RETURN
```

More

Keyboard Magic

With this sleight-of-hand program, you can decode your Commodore PET computer to expand its uses.

By Halvor Hobaek

Serious keyboard limitations, such as the lack of control characters, make the Commodore PET computer difficult to use as a terminal with a mainframe. But I found that software modifications can expand the keyboard's uses—you can establish one of the keys as a reset button and another as a control key which makes the complete set of control characters available. I want to share my discovery with those of you who are familiar with hex-code programming.

Decoding—the Hardware Aspect

The CBM decodes the keyboard as follows. The hardware consists of a PIA (peripheral interface adapter) (6520) located at the address $E810–$E813, a BCD (binary-coded decimal)-decoder and the keyboard itself. The keyboard is simply a number of button switches mounted on a board, each switch making contact-closure between two leads when the button is pressed.

The PIA contains two 8-bit I/O ports. The four least-significant bits of the A-port (address $E810) are defined as outputs, and connected to the BCD-decoder. The latter has four input pins and 10 output pins. Each of the latter corresponds to one of the combinations 0–9 on the input pins.

When activated, an output pin assumes a low voltage level (logic 0), while the others remain at a high voltage level (logic 1). Thus, by putting a value in the range 0–9 into the lower nybble of $E810, one of the output pins of the BCD-decoder assumes a low level. These 10 output pins are connected to search leads, which constitute the rows in a 10×8 key matrix, where the columns are eight test leads connected to the B-port of the PIA.

This port is accordingly defined as an input port, and is located at the address $E812. At each crossing of a search lead and a test lead there is room for a key switch, which connects the leads when pressed. Of the 80 possible keys only 72 are used. The locations of the keys in the matrix are shown in Table 1. Subscript p denotes keys located on the numeric pad.

Decoding—the Software Aspect

To decode the keyboard, a program activates the search leads successively and looks for a low level in any of the test leads. A pressed key is thus uniquely determined, and can be assigned a code value by a lookup table. Observe that the two shift keys are actually situated at different matrix points, although connected to the same search lead. They are not, as one might believe, connected to a separate I/O flag.

In the CBM operating system this decoding is done by a program that is part of the interrupt routine, which again is activated by the main's frequency. This interrupt routine can be separated into four program sequences, of which the keyboard decoding is the last one. The first three sequences take care of updating the clock, blinking the cursor and checking the cassette unit status, respectively.

To change the decoding of the keyboard you must replace the CBM interrupt routine with a new routine. I used the first two sequences of the old routine without change—they are relocatable and can be copied without modification from ROM. If you store programs on cassette, include the cassette status program sequence as well. I haven't tried this, but probably the safest procedure is to reestablish the old interrupt routine before calling any cassette routine.

The New Decoding Program

This program, which constitutes the last sequence of the new interrupt routine, is presented in Listing 1. The interrupt routine starts at hexadecimal address 6000, but the first two sequences are not shown. They occupy the space up to 601F. The program shown in the listing is not relocatable, since it contains two subroutines and one lookup table, but you can easily make the necessary changes.

The structure of the program is radically different from the one implemented in CBM. To rapidly execute the most frequently occurring case, that in which no key is depressed, the program scans through all the search lines in turn and takes action only if a test lead lies at a low level. This search takes about 230 μs, while the original routine takes about 1330 μs

Address correspondence to Halvor Hobaek, Department of Physics, University of Bergen, Bergen, Norway.

to perform the same search if no key is pressed.

To implement the control function, I chose the . (period or decimal character) key on the numeric pad as a control key for two reasons: This key belongs to the same search line as the two shift keys, and it is redundant since the period already exists on the keyboard. You could choose a different key for this function, but the program might become more complicated.

The choice of break key is more arbitrary. I found the ← (back arrow) key usable, but another key might do as well.

Program Description

Start by initiating certain memory locations and setting the PIA for search line number 9 (subroutine SET). The scan through the search lines takes place between lines 170 and 310. If any test line is low, the search line number is recorded in TX or TC; TC is reserved for line 6, which contains the shift and control (S/C) keys. At this stage consider the cases and their corresponding actions shown in Table 2.

The cases a) and d) in the table are detected during the initial search, while the cases b) and c) are treated under the corresponding label in the program. The program is not foolproof; it will distinguish keys on different search lines, but not simultaneously-pressed keys on the same search line (except S/C keys vs the others on line 6). This does not lead to problems in practice, however.

Search for shift and control keys is made by the subroutine SCTEST. If one of these keys is discovered, its presence is flagged in TEST ($0098) by bit 7 (control) or bit 0 (shift); if not, the routine returns with X=0.

From line 500 the index of the pressed key is calculated. This is used to fetch the ASCII code from the symbol table shown at the end of Listing 1. The test for Break occurs here. I chose to let this cause a branch to Break Entry in TIM, but other choices may be equally useful. The index of the last pressed key is stored in INDEX ($0097), and tested to prevent multiple entry. If no key is pressed, the value in INDEX becomes $FF.

From line 710 the ASCII code is modified according to the S/C keys. If control is active, only the five least-significant bits of the code are kept; if shift, a new code is calculated in the same fashion as in the old routine. (The described program runs on my CBM 3032, and should work without modification on all models with a business-style keyboard and a Rev. 3 ROM. This part of the program will be different for machines with other combinations of upper/lowercase symbols on the keys.)

The code of the new entry is then placed in the keyboard buffer. Before leaving the interrupt routine it is necessary to activate search line 9. This is because the Basic interpreter has a separate test for the Stop key which assumes that this line is activated and searches for a low value of test line 4. If line 9 is not activated, the last key entry search line will be activated instead, and thus a carriage return will cause a break in any Basic command.

An experienced computerist might observe at this stage that if only a break facility is needed, most of the program in Listing 1 is redundant. You could simply add a small program sequence as shown in Listing 2 at the head of the existing interrupt routine. Also, here the ← key is used as a break key, but in this case you are restricted to the keys on search line 9. To use this routine, you need only change the interrupt vector, as I've described in the next section.

Starting Up

Before you can use the new routine, it must be loaded into memory. The first section of the interrupt routine must be copied from ROM: $1F bytes starting at $E62E. Do this with a simple assembly program. Thereafter the program in Listing 1 is loaded. If it is to be used in a different memory location, the subroutine calls (lines 140, 360, 430, 510 and 1100) and the address of the symbol table (line 640) must be corrected accordingly.

A simple way to load the program is to use TIM—or better still, an assembler. To establish this program as an interrupt routine, instead of the built-in one, change the interrupt vector ($0090, $0091) to point at the new routine. This can also be done by using TIM. (Note that the content of the two addresses should be changed in the same command.)

A simple way to check if the new routine is actually being used is to press the . key on the numeric pad—it should no longer produce any reaction on the screen. Apart from that (and the break key), everything should seem to be as before.

You can save the routine on disk or cassette for later use. If you use cassettes, incorporate the third sequence of the old interrupt routine ($E64D-

	Test Lead Number							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	2	5	8	-	8_p	→		
1	1	4	7	0	7_p	↑		9_p
2	ESQ	s	f	h	]	k	;	5_p
3	a	d	g	j	CR	l	@	6_p
4	TAB	w	r	y	\	i	p	DEL
5	q	e	t	u	↓	o	[	4_p
6	$SHIFT_L$	c	b	.	$\cdot_p$		$SHIFT_R$	3_p
7	z	v	n	'	0_p		REPEAT	2_p
8	RVS	x	SPACE	m	CLR		/	1_p
9	←	3	6	9	STOP	:		

Table 1. Matrix for CBM business-type keyboard. Index p refers to keys on the numeric pad.

Case	Action
a) No key	Exit
b) One key	If S/C key: ignore (exit) If not S/C key: fetch code
c) Two keys	If one is an S/C key: fetch code of the other and modify, otherwise: ignore (exit)
d) Three or more keys	ignore (exit)

Table 2. Modified decoding sequence.

Listing 1. Hexadecimal program for decoding of CBM keyboard.

```
0010:                    PROGRAM FOR DECODING OF
0020:                    CBM KEYBOARD
0030: 601F                       ORG    $E01F
0040: 601F               BREAK   *      $FD17
0050: 601F               INDEX   *      $0097
0060: 601F               TEST    *      $0098
0070: 601F               TX      *      $0340
0080: 601F               TC      *      $0341
0090: 601F A0 00         INIT    LDYIM  $00
0100: 6021 84 98                 STYZ   TEST
0110: 6023 8C 41 03              STY    TC
0120: 6026 A2 09                 LDXIM  $09
0130: 6028 8E 40 03              STX    TX
0140: 602B 20 DC E0              JSR    SET
0150: 602E A0 02                 LDYIM  $02
0160: 6030 A9 FF                 LDAIM  $FF
0170: 6032 CD 12 E8      A       CMP    $E812   ;TEST FOR ANY LOW BIT
0180: 6035 D0 08                 BNE    LOW
0190: 6037 CE 10 E8      B       DEC    $E810
0200: 603A CA                    DEX
0210: 603B 10 F5                 BPL    A
0220: 603D 30 11                 BMI    TSTOUT  ;ALL LINES SEARCHED.
0230: 603F 88            LOW     DEY
0240: 6040 30 13                 BMI    TULLA
0250: 6042 E0 06                 CPXIM  $06     ;S/C SEARCH LINE ?
0260: 6044 F0 05                 BEQ    C
0270: 6046 8E 40 03              STX    TX
0280: 6049 D0 EC                 BNE    B
0290: 604B 8E 41 03      C       STX    TC
0300: 604E F0 E7                 BEQ    B
0310: 6050 88            TSTOUT  DEY
0320: 6051 F0 11                 BEQ    ONEKEY
0330: 6053 30 05                 BMI    TWOKEY
0340: 6055 86 97         TULLA   STX    INDEX   ;NO KEY PRESSED.
0350: 6057 4C CC E0              JMP    OUT
0360: 605A 20 E8 E0      TWOKEY  JSR    SCTEST  ;SEARCH FOR S/C KEY
0370: 605D 8A                    TXA             ;IF NOT FOUND :GET OUT!
0380: 605E F0 F5                 BEQ    TULLA
0390: 6060 88                    DEY
0400: 6061 8C 41 03              STY    TC
0410: 6064 AE 41 03      ONEKEY  LDX    TC
0420: 6067 F0 11                 BEQ    OK
0430: 6069 20 E8 E0              JSR    SCTEST  ;IF S/C LINE SEARCH ALSO
0440: 606C AD 12 E8              LDA    $E812   ;FOR OTHER KEYS ON THIS LINE.
0450: 606F 09 51                 ORAIM  $51
0460: 6071 C9 FF                 CMPIM  $FF
0470: 6073 F0 E0                 BEQ    TULLA
0480: 6075 AE 41 03              LDX    TC
0490: 6078 D0 09                 BNE    D
0500: 607A AE 40 03      OK      LDX    TX
0510: 607D 20 DC E0              JSR    SET
0520: 6080 AD 12 E8              LDA    $E812
0530: 6083 A8            D       TAY            ;CALCULATE INDEX CORRESPONDING
0540: 6084 8A                    TXA            ;TO SEARCH LINE NO.
0550: 6085 0A                    ASLA
0560: 6086 0A                    ASLA
0570: 6087 0A                    ASLA
0580: 6088 AA                    TAX
0590: 6089 CA                    DEX
0600: 608A 98                    TYA
0610: 608B E8            CARRY   INX            ;ADD BIT NO. TO INDEX.
0620: 608C 4A                    LSRA
0630: 608D B0 FC                 BCS    CARRY
0640: 608F BD 04 E1              LDAX   SYMBOL  ;FETCH CHARACTER.
0650: 6092 E4 97                 CPXZ   INDEX   ;IF EQUAL TO THE LAST
0660: 6094 F0 36                 BEQ    OUT     ;ONE: SKIP IT!
0670: 6096 86 97                 STX    INDEX   ;STORE INDEX OF NEW CHR.
0680: 6098 E0 48                 CPXIM  $48     ;BREAK-KEY?
0690: 609A D0 03                 BNE    E
0700: 609C 4C 17 FD              JMP    BREAK
0710: 609F B8            E       CLV
0720: 60A0 A6 98                 LDXZ   TEST
0730: 60A2 F0 1A                 BEQ    FOUND   ;CHECK FOR S/C MODIFICATIONS.
0740: 60A4 10 04                 BPL    SHIFT
0750: 60A6 29 1F                 ANDIM  $1F
0760: 60A8 50 14                 BVC    FOUND   ;CONTROL KEY!
0770: 60AA C9 2C         SHIFT   CMPIM  $2C     ;SHIFT KEY!
0780: 60AC 90 0E                 BCC    MODIF
0790: 60AE C9 3C                 CMPIM  $3C
0800: 60B0 B0 0A                 BCS    MODIF
0810: 60B2 E9 0F                 SBCIM  $0F
0820: 60B4 C9 20                 CMPIM  $20
0830: 60B6 B0 06                 BCS    FOUND
0840: 60B8 69 20                 ADCIM  $20
0850: 60BA D0 02                 BNE    FOUND
0860: 60BC 09 80         MODIF   ORAIM  $80
0870: 60BE A6 9E         FOUND   LDXZ   $9E     ;PUT CHR. IN KEYBD. BUFFER.
0880: 60C0 9D 6F 02              STAX   $026F
0890: 60C3 E8                    INX
0900: 60C4 E0 0A                 CPXIM  $0A
0910: 60C6 D0 02                 BNE    F
0920: 60C8 A2 00                 LDXIM  $00
0930: 60CA 86 9E         F       STXZ   $9E
```

More →

$E65F) into the new routine, or return to the old one before using any cassette command.

Saving hex code (programs as well as data) on disks is simple, but the procedure is not given in the CBM user manual. To save a program on drive 0, for example, use TIM and write:

.S"0:prog.name",08,start address, end address.

All addresses are in hex and no defaults are allowed.

Before using the new routine with Basic, be sure to protect against overwriting by Basic programs by changing the vector in $0034, $0035 to point to the highest free memory cell (+1) in RAM.

Words of Caution

I've been using this new routine for some time without serious problems, but there are certain aspects you should be aware of. Keybounce elimination is not as good as in the old routine. And if other programs are also using the interrupt vector, problems may arise—the machine falls back into the old interrupt routine.

TIM can deceive you.

When this happens, start the new interrupt routine before executing any other program. This won't help, however, if the other program conservatively resets the interrupt vector regularly from a ROM table. Treat such cases individually.

A possible problem of this kind exists in connection with the cassette routines: It appears in these routines that the CBM changes the interrupt vector, and eventually restores the vector to the regular CBM interrupt routine, but I'm not certain about this.

TIM can also deceive you. If you start executing a hex-code program from TIM, a vector stored at $0207, $0208 (note here the high/low bytes are reversed in order.) is established as an interrupt vector. The *safest way* to avoid such surprises is to press the break key (←) before executing a program—after the new interrupt routine is established. This automatically saves the new vector in $0207, $0208.

The break function will work

whenever the interrupt routine is attended, *until* the IRQ-disable bit in the CPU status register becomes set. If this should occur (by an error in your program?) you will not be able to return from your program in this way. The break causes the content of the registers at the moment of interrupt to become displayed on the screen. Note that, since this is an artificial break and not a genuine software break, the Program Counter points at an address one byte below the actual one. If the screen must be scrolled before the message can be written, the break function takes almost a second to work.

If shift and control keys are pressed simultaneously, control gets priority. Since the control function eliminates the most significant bytes, control-1 gives the same results as control-q, for example.

The new routine does not employ exactly the same storage locations as the old one; $00A6 (Key image) is replaced by $0340 (TX) and $341 (TC) in the cassette #2 buffer area. These may, of course, be placed at other parts of the memory. Just take care to place them at neighboring addresses.

If you need the ← symbol, choose another key (e.g., TAB ($20) or ESQ ($10)) as the break key by changing the number ($48) in line 680.■

Listing 1 continued

```
0940: 60CC AD 10 E8  OUT     LDA   $E810  ;SET SEARCH LINE FOR STOP _KEY
0950: 60CF 29 F0             ANDIM $F0
0960: 60D1 09 09             ORAIM $09
0970: 60D3 8D 10 E8          STA   $E810
0980: 60D6 68                PLA          ;RETURN SEQUENCE.
0990: 60D7 A8                TAY
1000: 60D8 68                PLA
1010: 60D9 AA                TAX
1020: 60DA 68                PLA
1030: 60DB 40                RTI
1040: 60DC AD 10 E8  SET     LDA   $E810  ;SET SEARCHLINE
1050: 60DF 29 F0             ANDIM $F0
1060: 60E1 19 40 03          ORAY  TX
1070: 60E4 8D 10 E8          STA   $E810
1080: 60E7 60                RTS
1090: 60E8 A0 01     SCTEST  LDYIM $01    ;SEARCH FOR SHIFT
1100: 60EA 20 DC 60          JSR   SET     ;OR CTRL KEY, AND SET CORRESP.
1110: 60ED AD 12 E8          LDA   $E812  ;FLAGS IN TEST. X=0 IF
1120: 60F0 49 FF             EORIM $FF    ;S/C NOT FOUND.
1130: 60F2 29 51             ANDIM $51
1140: 60F4 F0 0B             BEQ   TULLB
1150: 60F6 38                SEC
1160: 60F7 29 10             ANDIM $10
1170: 60F9 F0 03             BEQ   SHFT
1180: 60FB 66 98             RORZ  TEST
1190: 60FD 60                RTS
1200: 60FE 26 98     SHFT    ROLZ  TEST
1210: 6100 60                RTS
1220: 6101 A2 00     TULLB   LDXIM $00
1230: 6103 60                RTS
1240: 6104 32        SYMBOL  32 35 38 2D 38 1D 7F 7F 31 34 37 30 37 5E 7F 39
                              2  5  8  -  8              1  4  7  0  7  ↑     9
                             1B 53 46 48 5D 4B 3B 35 41 44 47 4A 0D 4C 40 36
                                S  F  H  ]  K  ;  5  A  D  G  J     L  @  6
                             09 57 52 59 5C 49 50 14 51 45 54 55 11 4F 5B 34
                                W  R  Y  \  I  P     Q  E  T  U     O  [  4
                             00 43 42 2E 2E 7F 00 33 5A 56 4E 2C 30 7F 7F 32
                                C  B  .  .        3  Z  V  N  ,  0        2
                             12 58 20 4D 13 7F 2F 31 5F 33 36 39 03 3A 7F 7F
                                X     M        /  1  _  3  6  9     :
SYMBOL TABLE

INDEX  0097   TEST   0098   TX     0340   TC     0341
INIT   601F   A      6032   B      6037   LOW    603F
C      604B   TSTOUT 6050   TULLA  6055   TWOKEY 605A
ONEKEY 6064   OK     607A   D      6083   CARRY  608B
E      609F   SHIFT  60AA   MODIF  60BC   FOUND  60BE
F      60CA   OUT    60CC   SET    60DC   SCTEST 60E8
SHFT   60FE   TULLB  6101   SYMBOL 6104   END    6153
BREAK  FD17
```

```
AD  12  E8      LDA     $E812
C9  FE          CMPIM   $FE
D0  03          BNE     AA
4C  17  FD      JMP     BREAK   ($FD17)
4C  2E  E6  AA  JMP     OLDIRQ  ($E62E)
```

Listing 2. Simple implementation of a break key.

The H89 Revisited

Since we first introduced the H89 in the pages of* Microcomputing *(March 1981), much support has sprung up around this micro. Here's an update on what's been happening with Heath's "All-in-One" computer.

By Martin Moore

In a two-part series on the Heath H89 in the March and April 1981 issues of *Microcomputing*, I talked about the hardware and software capabilities of the H89 as they stood in the early 1980s.

Well, friends, things have changed. The Heath company has gone all out—with a whole raft of hardware and software options—to broaden its support of the H89. In this article, I'll bring you up to date on what's available for the H89 in both hardware and software.

H89 Hardware

Along with most other minicomputer vendors, Heath got clobbered with the new FCC ruling on electromagnetic interference (EMI). (That ruling says, in a nutshell, that your computer shouldn't generate enough noise to cause any kind of interference on your own television or on your neighbor's.) By itself, structural foam doesn't do much to dampen EMI, so Heath was forced to do some redesigning of H89 electronics in order to bring them into line.

The H89—still going strong.

Most of the changes, however, involved shielding and general quieting-down of the logic. The basic hardware design didn't change—and that's an advantage. If the new hardware is as reliable as the hardware in my H89 (it hasn't had a single failure in the three years since I put it together), Heath has a good thing going.

The biggest change in the hardware is a result of Heath's need to put CP/M on the H89. Standard CP/M must be based near location 0000H in memory, but Heath was using that space for the system monitor. So the memory structure of the H89 was redesigned to accommodate CP/M. Another plus is the expansion from 48K to 64K of RAM.

Operating System Software

The greatest change in H89 software comes in the availability of CP/M. Heath still offers an updated version (2.0) of HDOS, but now you can run standard CP/M (2.2), along with the multitude of CP/M software available, on the H89.

A number of improvements have been added to HDOS. Most of them are a result of RAM being started at 0000H. HDOS 1.6 stored the system

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*128K bytes standard.
**Optional.

The H-100 is easy to build – the step-by-step Heathkit manual shows you how. And every step of the way, you have our pledge – "We won't let you fail." Help is as close as your phone, or the nearest Heathkit Electronic Center.†

And what better way to learn state-of-the-art computing techniques than to build the world's only 16-bit/8-bit computer kit? To run today's higher-speed, higher-performance 16-bit software, you need an H-100. It makes a big difference by processing more data faster.

Dual microprocessors for power and compatibility. The H-100 handles both high-performance 16-bit software and most current Heath/Zenith 8-bit software.

Want room to grow? The H-100's standard 128K byte Random Access Memory complement can be expanded to 768K bytes – compared to a 64K standard for many desktop computers.

And the industry-standard S-100 card slots support memory expansion and additional peripheral devices, increasing future upgradability of the H-100.

High-capacity disk storage, too. The H-100's 5.25" floppy disk drive can store 320K bytes on a single disk. The computer also supports an optional second 5.25" and external 8" floppy disk drives. And an optional internal Winchester disk drive will be available soon.

For more information, circle the reader service number below. Better yet, visit your Heathkit Electronic Center for a demonstration!

The H-100 gives me the most for my computer dollar!

Heathkit®
Heath Company

Heathkit Electronic Centers are units of Veritechnology Electronics Corporation.
Heath Company and Veritechnology Electronics Corporation are subsidiaries of Zenith Radio Corporation.
+ CP/M is a registered trademark of Digital Equipment Corporation.

Circle 236 on Reader Service card

device drivers (floppy and terminal) in ROM. HDOS 2.0 stores the device drivers on disk and loads them into memory at bootup. Because they're on disk, you can replace the drivers easily if something better comes along (and something better *has* come along, but we'll discuss that later).

The Heath assembler has been upgraded, too. The assembler now generates a cross-reference table for labels so you don't lose them in the code.

Other standard programs, like Basic and the Editor, haven't been changed much. If you liked or didn't like them before, you'll feel the same about them now.

One of the nice things Heath did was to break out all of its peripheral device drivers (for line printers or alternate terminals) and provide the documented source code as a bonus. If you're interested in experimenting with the peripheral device drivers, the source is there.

Heath has solved some of the complaints registered about 1.6, like the business of having to repeatedly press the space bar in order to boot up. HDOS now stores the terminal baud rate and port information on the disk and looks it up at boot time. You also have the option of bypassing the request for date. However, once you enter the date, HDOS won't ask again unless you power-down the H89.

Another interesting feature is HDOS's willingness to boot up by itself if you don't want to request a boot. After you've entered the B command from the monitor, HDOS will wait 30 seconds for you to enter a Return; if you don't, the system boots itself.

> Heath is offering a lot more software than just HDOS and CP/M, including Pascal, Fortran, a Basic compiler and Cobol.

Heath's additon of CP/M was an excellent decision. There's probably more CP/M software running around these days than anyone could possibly use, and most of it will run on the H89.

Heath provides three CP/M system modules: BIOS, BDOS and CCP. BIOS (which is supplied in both source and object) contains the hardware I/O code peculiar to the H89, BDOS is the core of the operating system, and CCP is the command interpreter.

Along with BIOS, BDOS and CCP, you get a two-pass 8080 assembler (why don't they offer a Z-80 assembler standard?), a text editor, an 8080 debugger with all sorts of capabilities (including execution trace), and other utilities to set system parameters.

Software Accessories

Heath is offering a lot more than just HDOS and CP/M these days. You can get a UCSD Pascal P-code compiler, a Fortran compiler, a Basic compiler and Cobol.

Pascal is all the rage these days—and rightfully so. Pascal is a language that almost forces you to do structured, top-down programming.

Heath's Pascal is a P-code generator. You create a program in the Pascal language and compile it into what's called P-code. The P-code is then run on a P-code interpreter, much like most Basic languages are run on interpreters.

The P-code is somewhat universal—the code generated can run on most other machines that are able to execute P-code. And P-code runs quite a bit faster than Benton Harbor Basic.

The availability of Fortran proves that you shouldn't count a horse out before the race is finished. Fortran is one of the oldest languages around, but it maintains a fair degree of popularity.

Heath provides Fortran by way of the Microsoft people. Along with the compiler, you get the Microsoft Macro-80 relocating 8080/Z-80 assembler, the Link-80 editor (to convert libraries and modules into executable code) and the Microsoft Fortran library. Fortran is available in either HDOS or CP/M format.

Basic Compiler

The Basic compiler converts a Basic program directly into machine code to run on the H89. Microsoft has thrown in the Macro-80 relocating assembler, the Link-80 linking editor and the Lib-80 library manager. Modules created under another language (like Microsoft Fortran) can be used with the compiler.

The business folks haven't been for-

gotten. Heath sells the Microsoft Cobol package, which runs under CP/M. And Heath now offers business-oriented software from Peachtree, as well as a flock of other releases, including WordMaster, WordStar, Mail/Merge, SuperSort, SuperCalc and DataStar—all premium programs.

If you're looking for a source of low-cost software, contact Walt Bilofsky at Software Toolworks (15233 Ventura Blvd., Suite 118, Sherman Oaks, CA 91403) and ask for a catalog. Software Toolworks produces quality merchandise at reasonable prices, and its software is available in both HDOS and CP/M formats.

Add-Ons

This is where Heath broke some ground. Along with the standard 5¼-inch drive, you now can add eight-inch drives. Heath selected the Remex RFS 4810 and 4820 drives to boost disk capacity to more than two megabytes.

The Remex 4810 and 4820 drives operate in a "master/slave" environment. That is, the 4810 is "smart" and the 4820 "dumb." The smart 4810 allows Heath to dump a lot of the control functions onto the drive, keeping the controller and control software simple. The drives require a different controller than the one provided as standard, but with the new controller the H89 can handle three 5¼-inch drives *and* the two Remex drives—2.3 megabytes of storage!

If you want to expand H89 storage, you can add a 5¼-inch Winchester technology drive.

Winchester drives are available from a couple of sources: American Computer and Telecommuncations Corp. (ACT, 11301 Sunset Hills Road, Reston, VA 22090) and Magnolia Microsystems (2812 Thorndyke West, Seattle, WA 98199).

The ACT storage system includes a controller and Seagate Technology ST506 drive. The ST506 stores five megabytes of formatted information—more than enough to satisfy most needs.

> You needn't worry about lacking software or hardware support for the Heath H89.

Both the ACT and Magnolia Microsystems storage systems use CP/M as their standard operating system, and provide CP/M when you buy the controller and drives.

C.D.R. Systems, Inc., is offering a replacement controller for the H89 that runs the standard 5¼-inch drive at double-density formats, thus doubling the storage capacity of the drive. The controller also lets you add all sorts of combinations of drives to the H89.

Another piece of add-on hardware comes from Maxtek, Inc. (2908 Oregon Court, Torrance, CA 90503). Maxtek has what it calls an XCEL Graphics Unit that turns the H89 into a graphics computer with a 512 × 240 pixel display. Along with the display-modification hardware, you can buy enough support software to turn the H89 into a real graphics computer that will handle symbols, graphs, 3-D images and surface plots.

Peripherals

Heath has added a couple of new printers to its line. One is the H25 (kit form) or Z-25 (assembled). The H25 prints at 150 characters per second and it prints all 33 graphics images generated by the H89 or H19. The H25 prints 10, 12, 13.2 or 16.5 characters per inch.

Conclusion

If, in the past, you were worried about buying a Heath H89 because of a lack of software or hardware support, worry no more. At this point, there is almost as much available for the H89 as there is for any other computer.

Even though Heath is now selling the H100-series personal computers, they still offer the H89. The price has dropped, and you can pick up about $1000 worth of free software, including the HDOS or CP/M operating system, Microsoft Basic, Fortran, Cobol, Magic Wand or SuperCalc.

If the H89 was a good deal before (and I think it was), then it's an even better deal now. Take a look.■

Address correspondence to Martin Moore, 2735 S.W. 229, Aloha, OR 97006.

CONVERSIONS "II"

Each month Microcomputing will publish translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.

Program conversion of the Cross-Reference program (published in the March 1983 Microcomputing) for the Heath/Zenith H8 and H89 systems. By Robert Schnabel, 5227 Trailway Drive, Rockville, MD 20853.

```
10 '                CROSSREF
20 '                Adapted for MICROSOFT Basic by R.H.Schnabel
30 '                from a CBASIC Version by James Monagan
40 '                Published in MICROCOMPUTING, March 1983
50 '
60 '                Runs Under HDOS/MBASIC and Cross References
70 '                Both BH Basic and MBASIC ASCII Listing Files
80 '
90 CLEAR 2500
100 SS$=STRING$(110,45)
110 DIM RW$(144),PT%(25):FD$="     #####"
120 SK=91:H2$="INCLUDED PROGRAMS":H1$="SYMBOLS":H$="LINE NUMBERS"
130 DIM VN%(591),V$(591),FR%(500),LS%(500),RF%(2500),NX%(2500)
140 '
150 '                         FILL ARRAY WITH RESERVED WORDS
160 '
170 RW=0
180 READ RW$(RW)
190 IF RW$(RW)="~" THEN 240
200 I=ASC(RW$(RW))-65
210 IF PT%(I)>0 THEN PT%(I)=RW
220 RW=RW+1
230 GOTO 180
240 FOR I=0 TO 25
250 IF PT%(I)=0 THEN PT%(I)=RW
260 NEXT
270 '
280 '                         GET SOURCE FILE NAME
290 '
300 PRINT:LINE INPUT"  Source File Name:    ";F$
310 IF F$=""THEN 300
320 OPEN "I",1,F$
330 IF MID$(F$,4,1)=":" THEN F$=RIGHT$(F$,LEN(F$)-4)
340 FOR I=8383 TO 8391:D$=D$+CHR$(PEEK(I)):NEXT
350 PR$="'"+F$+"'          "+D$
360 '
370 '                         INITIALIZE FOR CROSS REFERENCE
380 '
390 LC=0:PZ=0:V$="":VC=SK:RC=-1
400 FOR I=0 TO SK:VN%(I)=-1:NEXT
410 '
420 '                         INPUT SOURCE LINE
430 '
440 IF EOF(1) THEN 1200 ELSE LINE INPUT #1,L$
450 LG=LEN(L$):BR=0:LC=LC+1:NF=0:IF C$=CHR$(64) THEN NF=1
460 LP=0:PRINT STR$(LC);":";L$
470 '
480 '                         PARSE LINE
490 '
500 LP=LP+1
510 IF LP>LG THEN GOSUB 680:GOTO 440
520 C$=MID$(L$,LP,1)
530 IF C$>="A" AND C$<="Z" THEN 1120
540 IF C$>="0" AND C$<="9" THEN 1150
550 IF C$=" " OR C$=CHR$(9) THEN GOSUB 680:GOTO 500
560 IF C$="'" THEN GOSUB 680:GOTO 440
570 IF C$=":" THEN BR=0
580 IF C$<>CHR$(34) THEN 620
590 GOSUB 680:IF MF=1 THEN MF=0:GOTO 610
600 IF LP<LG THEN LP=INSTR(LP+1,L$,C$):IF LP<=0 THEN LP=LG
610 IF LP>=LG THEN 440 ELSE GOTO 500
620 IF C$="$" OR C$="%" OR C$="#" OR C$="!" THEN 1130
630 GOSUB 680
640 GOTO 500
650 '
660 '                         END VARIABLE
670 '
680 IF V$="" THEN RETURN
690 IF NF=0 THEN LN=VAL(V$):V$="":NF=1:RETURN
700 C=ASC(V$):IF C<65 THEN 870
710 '
720 '                         TEST FOR COMMAND
730 '
740 P=PT%(C-65):BR=0:RW$=""
750 IF C<ASC(RW$(P)) THEN 810
760 IF V$>RW$(P) THEN P=P+1:GOTO 750
770 RW$=V$
780 IF V$="DATA" OR V$="REM" OR V$="REMARK" THEN LP=LG+1:GOTO 810
790 IF V$="GOTO" OR V$="GOSUB" OR V$="THEN" THEN BR=1:
800 IF V$="MERGE" OR V$="CHAIN" OR V$="RUN" OR V$="LOAD" THEN 1040
810 IF RW$<>"" THEN V$="":RETURN
820 IF C$="(" THEN V$=V$+"()"
830 C=C+1:IL=-1:I=C
840 IF V$=(V$(I))THEN 930
850 IL=I:I=VN%(I)
860 IF I>0 THEN 840 ELSE GOTO 960
870 IF VAL(V$)<1000 THEN C=INT(VAL(V$)/100) ELSE C=9+INT(VAL(V$)/1000)
880 IF C>65 THEN C=65
890 IL=-1:I=C
900 IF VAL(V$)<=VAL(V$(I)) THEN 930
910 IL=I:I=VN%(I)
920 IF I>0 GOTO 900 ELSE GOTO 960
930 IF V$<>V$(I) THEN 960
940 J=LS%(I-SK)
950 IF RF%(J)=LN THEN GOTO 1000 ELSE RC=RC+1:NX%(J)=RC:GOTO 990
960 VC=VC+1
970 IF IL>=0 THEN VN%(IL)=VC
980 V$(VC)=V$:VN%(VC)=I:RC=RC+1:FR%(VC-SK)=RC:I=VC
990 RF%(RC)=LN:NX%(RC)=-1:LS%(I-SK)=RC
```

Listing continued.

```
1000 V$="":RETURN
1010 '
1020 '                        MERGED PROGRAM REFERENCES
1030 '
1040 IF ASC(C$)=34 THEN L1=LP:MF=1:GOTO 1060
1050 L1=INSTR(LP+1,L$,CHR$(34)):IF L1<=0 THEN 1000
1060 L2=INSTR(L1+1,L$,CHR$(34)):IF L2<=0 THEN 1000
1070 M=M+1:LP=L2:M$(M)=MID$(L$,L1+1,L2-L1-1)+STR$(LN)
1080 GOTO 1000
1090 '
1100 '                        EXPAND VARIABLE
1110 '
1120 V$=V$+C$:GOTO 500
1130 IF V$<>"" THEN V$=V$+C$
1140 GOTO 500
1150 IF V$>"" OR NF=0 OR BR>0 THEN V$=V$+C$
1160 GOTO 500
1170 '
1180 '                        PRINT SYMBOL TABLE
1190 '
1200 CLOSE #1:'               CLOSE SOURCE FILE
1210 '
1220 OPEN "O",1,"AT:":GOSUB 1530:SZ=-1
1230 FOR J=0 TO SK:V=J
1240 V=VN%(V)
1250 IF J=66 AND H$<>H1$ THEN H$=H1$:GOSUB 1570:SZ=-1
1260 IF V<0 THEN 1410
1270 IF LZ>60 THEN GOSUB 1510:GOTO 1300
1280 SZ=SZ+1
1290 IF SZ=3 THEN PRINT #1,:SZ=0:LZ=LZ+1
1300 RZ=0:I=FR%(V-SK):PRINT #1,V$(V),
1310 IF RZ=0 THEN PRINT #1,TAB(16);
1320 PRINT #1,USING FD$;RF%(I);
1330 RZ=RZ+1
1340 IF RZ<10 THEN 1370
1350 RZ=0:PRINT #1,:LZ=LZ+1
1360 IF LZ>60 THEN GOSUB 1510
1370 I=NX%(I)
1380 IF I>0 THEN 1310
1390 IF RZ>0 THEN PRINT #1,:LZ=LZ+1
1400 GOTO 1240
1410 NEXT J
1430 IF M>0 THEN GOSUB 1640
1432 PRINT #1, SS$
1440 PRINT #1, "TOTAL LINES:";LC;"     CALLED LINES & SYMBOLS:";VC-SK;
1450 PRINT #1, "     REFERENCES:";RC+M+1:LZ=LZ+2
1460 FOR I=LZ TO 66:PRINT #1,:NEXT I:CLOSE
1470 END
1480 '
1490 '                        HEADERS
1500 '
1510 FOR I=1 TO 66-LZ:PRINT #1,:NEXT
1520 '                        PAGE HEADER
1530 PRINT #1,
1540 PZ=PZ+1:PRINT #1,PR$;TAB(110);"Page";PZ
1550 LZ=2
1560 '                        SECTION HEADERS
1570 IF LZ>56 THEN GOSUB 1510
1580 PRINT #1,SS$
1590 PRINT #1,H$;TAB(20);"REFERENCE LINE"
1600 PRINT #1,SS$:PRINT #1,:LZ=LZ+4:SZ=0:RETURN
1610 '
1620 '                        INCLUDED PROGRAMS
1630 '
1640 LZ=LZ+1:H$=H2$:GOSUB 1570
1650 FOR I=1 TO M:IF LZ>60 THEN GOSUB 1510
1660 J=INSTR(1,M$(I)," ")
1670 PRINT #1,LEFT$(M$(I),J-1);TAB(16);
1680 PRINT #1,USING FD$;VAL(RIGHT$(M$(I),LEN(M$(I))-J))
1690 LZ=LZ+1:NEXT I
1700 RETURN
1710 '
1720 DATA"ABS","AND","AS","ASC","ATN","AUTO","BUILD","BYE"
1730 DATA"CINT","CSGN","CDBL","CIN","CINT"
1740 DATA"CHAIN","CHR$","CLEAR","CLOSE","CNTRL","CONT","CONTINUE"
1750 DATA"COS","CSNG","CVD","CVI","CVS","DATA","DEF","DEFDBL"
1760 DATA"DEFINT","DEFSNG","DEFSTR","DEFUSR","DELETE","DIM","EDIT","ELSE","END"
1770 DATA"EOF","ERASE","ERL","ERR","ERROR","EXP","FIELD","FILE","FIX","FN"
1780 DATA"FOR","FRE","FREE","FREEZE","GET","GOSUB","GOTO","HEX$","IF","IMP"
1790 DATA"INP","INPUT","INPUT$","INSTR","INT","KILL","LEFT$","LEN","LET"
1800 DATA"LINE","LIST","LNO","LOAD","LOC","LOCK","LOF","LOG","LSET","MARCH"
1810 DATA"MAX","MERGE","MID$","MIN","MKD$","MKI$","MKS$","MOD"
1820 DATA"NAME","NEW","NEXT","NOT","NULL","OCT$","OLD","ON","OPEN"
1830 DATA"OR","OUT","PAD","PAUSE","PEEK","PIN","POKE","POS","PRINT","PUT"
1840 DATA"READ","REM","RESET","RESTORE","RESUME","RETURN","RIGHT$","RND","RSET"
1850 DATA"RUN","SCRATCH","SAVE","SEG","SGN","SIN","SPACE$","SPC","SQR","STEP"
1860 DATA"STOP","STR$","STRING$","SWAP","SYSTEM","TAB","TAN","THEN","TO"
1870 DATA"TRON","TRON","UNFREEZE","UNLOCK","UNSAVE","USING","USR"
1880 DATA"VAL","VARPTR","WAIT","WIDTH","WRITE","XOR","~"
```

Librarian program (December 1982 Microcomputing) converted to run on a Commodore 8032 computer. By Jose Luis Arriola, 1036 Aquamarine Lane, Corona, CA 91720.

```
LIBRARIAN

100 REM "♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦"
110 REM "♦                                                        ♦"
120 REM "♦   PROGRAMMER:  ALFRED FANT                              ♦"
130 REM "♦                                                        ♦"
140 REM "♦   PROGRAM:     LIBRARIAN                                ♦"
150 REM "♦                                                        ♦"
160 REM "♦   ABSTRACT:                                            ♦"
170 REM "♦         THIS PROGRAM IS DESIGNED TO FUNCTION AS A STANDARD  ♦"
180 REM "♦      CARD CATALOG SYSTEM FOR A HOME LIBRARY.  IT PROVIDES   ♦"
190 REM "♦      AN ORDERED LIST OF BOOKS ACCORDING TO THEIR:  AUTHOR.  ♦"
200 REM "♦      TITLE. SUBJECT.                                   ♦"
210 REM "♦                                                        ♦"
220 REM "♦      THIS PROGRAM ORIGINALLY WRITTEN IN IBM-BASIC      ♦"
230 REM "♦           CONVERTED TO CBM-BASIC (8032) BY JOSE ARRIOLA ♦"
240 REM "♦                                                        ♦"
250 REM "♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦"
260 CLR:CM$=CHR$(44):SP$="                    "
```

More

Listing continued.

```
270 DOPEN#1,"BSHELVES",L62
280 IFDS>20ANDDS<>50THENPRINTDS$:DCLOSE:STOP
290 PRINT"□"
300 PRINT"MENU.       1 : NEW BOOK"
310 PRINT"            2 : SEARCHES"
320 PRINT"            3 : DELETE BOOK"
330 PRINT"            4 : NEW LIBRARY"
340 PRINT"            5 : STOP"
350 PRINT
360 PRINT"CHOICE : ";
370 GETCH$:IFCH$=""THEN370
380 IFCH$<"1"ORCH$>"5"THEN370
390 PRINTCH$;FORJ=1TO1000:NEXTJ
400 CH=VAL(CH$)
410 ONCHGOSUB430,650,1640,1900,2070
420 GOTO290
430 REM CHOICE=1 NEW BOOK SUBROUTINE
440 RECORD#1,1,1
450 INPUT#1,F$
460 IFDS<>0THENPRINTDS$:DCLOSE:STOP
470 SZ=VAL(F$):I=1
480 I=I+1
490 RECORD#1,(I),1
500 INPUT#1,AU$
510 IFDS<>0THENPRINTDS$:DCLOSE:STOP
520 IFAU$=SP$ORI=SZTHEN540
530 GOTO480
540 IFI+1<>SZTHENPRINT:PRINT:PRINT"LIBRARY IS FULL":FORJ=1TO2000:NEXTJ:RETURN
550 INPUT"AUTHOR ";AU$
560 IFLEN(AU$)>20THENPRINT"MAX NUMBER OF CHARACTERS IS 20":GOTO550
570 INPUT"TITLE  ";TT$
580 IFLEN(TT$)>20THENPRINT"MAX NUMBER OF CHARACTERS IS 20":GOTO570
590 INPUT"SUBJECT";SU$
600 IFLEN(SU$)>20THENPRINT"MAX NUMBER OF CHARACTERS IS 20":GOTO590
610 RECORD#1,(I),1
620 PRINT#1,AU$;CM$;TT$;CM$;SU$
630 IFDS<>0THENPRINTDS$:DCLOSE:STOP
640 RETURN
650 REM CHOICE=2 SEARCHES SUBROUTINE
660 PRINT"□"
670 INPUT"READY.      AUTHOR     ■■■■";AU$
680 INPUT"            TITLE      ■■■■";TT$
690 INPUT"            SUBJECT    ■■■■";SU$
700 D=3:PRINT:PRINT:PRINT"WANT HARD COPY? "
710 GETB$:IFB$=""THEN710
720 IFB$<>"Y"ANDB$<>"N"THEN710
730 IFB$="Y"THEND=4
740 OPEN4,D
750 PRINT#4,"□"
760 PRINT#4,SPC(32)"BOOKS IN LIBRARY":PRINT#4
770 PRINT#4,SPC(9)"AUTHOR"SPC(19)"TITLE"SPC(20)"SUBJECT":PRINT#4
780 IFAU$="*"ANDTT$="*"ANDSU$="*"THENMENU=1
790 IFAU$<>"*"ANDTT$="*"ANDSU$="*"THENMENU=2
800 IFAU$<>"*"ANDTT$<>"*"ANDSU$="*"THENMENU=3
810 IFAU$<>"*"ANDTT$<>"*"ANDSU$<>"*"THENMENU=4
820 IFAU$="*"ANDTT$="*"ANDSU$<>"*"THENMENU=5
830 IFAU$="*"ANDTT$<>"*"ANDSU$="*"THENMENU=6
840 Z$=AU$:Y$=TT$:X$=SU$
850 ONMENUGOSUB900,1020,1140,1260,1380,1500
860 PRINT#4:CLOSE4,D
870 PRINT"PRESS ANY KEY TO CONTINUE"
880 GETB$:IFB$=""THEN880
890 RETURN
900 REM MENU=1 SUBROUTINE
910 RECORD#1,1,1
920 INPUT#1,F$
930 IFDS<>0THENPRINTDS$:DCLOSE:STOP
940 SZ=VAL(F$):I=1
950 I=I+1
960 RECORD#1,(I),1
970 INPUT#1,AU$,TT$,SU$
980 IFDS<>0THENPRINTDS$:DCLOSE:STOP
990 IFAU$<>SP$THENGOSUB1620
1000 IFI<>SZTHEN950
1010 RETURN
1020 REM MENU=2 SUBROUTINE
1030 RECORD#1,1,1
1040 INPUT#1,F$
1050 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1060 SZ=VAL(F$):I=1
1070 I=I+1
1080 RECORD#1,(I),1
1090 INPUT#1,AU$,TT$,SU$
1100 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1110 IFAU$<>SP$ANDAU$=Z$THENGOSUB1620
1120 IFI<>SZTHEN1070
1130 RETURN
1140 REM MENU=3 SUBROUTINE
1150 RECORD#1,1,1
1160 INPUT#1,F$
1170 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1180 SZ=VAL(F$):I=1
1190 I=I+1
1200 RECORD#1,(I),1
1210 INPUT#1,AU$,TT$,SU$
1220 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1230 IFAU$<>SP$ANNDAU$=Z$ANDTT$=Y$THENGOSU1740
1240 IFI<>SZTHEN1190
```

More

Listing continued.

```
1250 RETURN
1260 REM MENU=4 SUBPOUTINE
1270 RECORD#1,1,1
1280 INPUT#1,F$
1290 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1300 SZ=VAL(F$):I=1
1310 I=I+1
1320 RECORD#1,(I),1
1330 INPUT#1,AU$,TT$,SU$
1340 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1350 IFAU$<>SP$ANDTT$=Y$ANDSU$=X$THENGOSUB1620
1360 IFI<>SZTHEN1190
1370 RETURN
1380 REM MENU=5 SUBPOUTINE
1390 RECORD#1,1,1
1400 INPUT#1,F$
1410 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1420 SZ=VAL(F$):I=1
1430 I=I+1
1440 RECORD#1,(I),1
1450 INPUT#1,AU$,TT$,SU$
1460 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1470 IFAU$<>SP$ANDSU$=X$THENGOSUB1620
1480 IFI<>SZTHEN1430
1490 RETURN
1500 REM MENU=6 SUBPOUTINE
1510 RECORD#1,1,1
1520 INPUT#1,F$
1530 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1540 SZ=VAL(F$):I=1
1550 I=I+1
1560 RECORD#1,(I),1
1570 INPUT#1,AU$,TT$,SU$
1580 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1590 IFAU$<>SP$ANDTT$=Y$THENGOSUB1620
1600 IFI<>SZTHEN1550
1610 RETURN
1620 PRINT#4,SPC(5)AU$SPC(5+(20-LEN(AU$)))TT$SPC(5+(20-LEN(TT$)))SU$
1630 RETURN
1640 REM CHOICE=3 DELETE BOOK SUBROUTINE
1650 II=0:PRINT"ARE YOU SURE?"
1660 GETB$:IFB$=""THEN1660
1670 IFB$<>"Y"ANDB$<>"N"THEN1660
1680 IFB$="N"THENRETURN
1690 INPUT"AUTHOR ";A$
1700 INPUT"TITLE  ";T$
1710 RECORD#1,1,1
1720 INPUT#1,F$
1730 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1740 SZ=VAL(F$):I=1
1750 I=I+1
1760 RECORD#1,(I),1
1770 INPUT#1,AU$,TT$,SU$
1780 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1790 IFA$=AU$ANDT$=TT$THENPRINT"DELETED: ";AU$;"    ";TT$;"    ";SU$:II=I:GOTO1
830
1800 IFI<>SZTHEN1750
1810 PRINT"BOOK NOT IN LIBRARY"
1820 GOTO1870
1830 IF11<>0THENAU$=SP$:TT$=SP$:SU$=SP$
1840 RECORD#1,(II),1
1850 PRINT#1,AU$
1860 IFDS<>0THENPRINTDS$:DCLOSE:STOP
1870 PRINT:PRINT:PRINT"PRESS ANY KEY TO CONTINUE"
1880 GETB$:IFB$=""THEN1880
1890 RETURN
1900 REM CHOICE=4 NEW LIBRARY SUBROUTINE
1910 PRINT"ARE YOU SURE?"
1920 GETB$:IFB$=""THEN1920
1930 IFB$<>"Y"ANDB$<>"N"THEN1920
1940 IFB$="N"THENRETURN
1950 INPUT"ENTER LIBRARY SIZE IN BOOKS";SZ
1960 F$=STR$(SZ)
1970 AU$=SP$
1980 RECORD#1,1,1
1990 PRINT#1,F$
2000 IFDS<>0THENPRINTDS$:DCLOSE:STOP
2010 FORI=2TOSZ+1
2020 RECORD#1,(I),1
2030 PRINT#1,AU$
2040 IFDS<>0THENPRINTDS$:DCLOSE:STOP
2050 NEXTI
2060 RETURN
2070 REM CHOICE=5 STOP SUBPOUTINE
2080 DCLOSE
2090 END
READY.
```

The Chinese Are Coming! The Chinese Are Coming!

American, Japanese and Bristish manufacturers be warned: The Chinese have entered the microcomputer sweepstakes. The MPF-I Micro-Professor, from MultiTech Industrial Corp. in Taiwan, is a Z-80-based single board computer that features 2K RAM and a 2K EPROM with a monitor program and an 8255 PPI (programmable peripheral interface).

By Anthony Scarpelli

Can a single-board computer from China with similarities to the KIM-1 compete against those from Japan, England and the United States in the microcomputer marketplace?

That was the overriding question I had as I opened the box containing the Multitech Electronics, Inc. (195 West El Camino Real, Sunnyvale, CA 94086), MPF-I Micro-Professor. This Z-80-based single-board computer features 2K of RAM, a 2K EPROM that contains the monitor program and an 8255 PPI (programmable peripheral interface), which interfaces to a six-digit LED display, a 36-key keypad, a two-inch speaker and cassette I/O.

Also on the board are eight support chips, a 3.579 MHz crystal, which is divided by two to get a 1.789 MHz system clock, and a small 34×90 mm area that can be used for expansion purposes. There are also two LED status indicators, two transistors, a 5 V regulator, two ⅛-inch phone jacks for cassette I/O and a power receptacle. A 9 V power supply adapter comes with the micro. In addition, there are two 40-pin connectors for system expansion.

Three empty sockets on the board accommodate a Z-80 CTC (counter-timer circuit), a Z-80 PIO (parallel I/O circuit) and up to 2K RAM or 4K ROM for memory expansion. With a fully loaded board you can have up to 4K of RAM, or up to 8K of ROM by replacing the 2K EPROM with a 4K chip and then by installing another 4K unit in the RAM/EPROM socket.

Sorry, No Basic

If you intend to expand, I would suggest you order the extra RAM, EPROMs, CTC and PIO at the same time you order the board (see expansion table). Since some of the experiments in the manual cover the CTC, I recommend obtaining the IC as well as the extra RAM. However, if you can get a PIO, do so, since you'll probably want to experiment with all of the components as soon as you can, especially if you're familiar with assembly language. There is no Basic, just pure machine code.

The MPF-I is designed as a learning tool to teach the essence of the Z-80 and assembly language. It can be used in control applications because of all of its interfacing capabilities. And if you're up to it, it can serve as the basis of a full-fledged Z-80-based computer that can run any of the higher languages. You can also expand this computer to its fullest capacity with as much power as any other Z-80-based system. But this is completely dependent on your technical abilities and/or your budget.

Options for the unit include the programmer board, a speech synthesizer board for $129 and a printer, also on a single board, for $99. Nothing else, not even software, is currently available.

The computer comes in a cute plastic box that opens like a book and holds the board fairly snug. The optional boards will fit into the other side of the book.

The MPF-I is a product of Multitech Industrial Corp. in Taiwan, Republic of China. The overall design of the computer is comparable to any other state-of-the-art single-board computer. However, at $149, it deserves a closer look.

The Manual

The manual that comes with the system deserves a lot of discussion. It's hard to describe the manual as good, but at the same time, I can't say that it's bad—maybe just different.

The main difference is the language. No, it's not in Chinese, but it was written by someone not completely familiar with the English language. It is both funny and annoying, yet surprisingly understandable if you can get past the corkscrew grammar.

The manual is fairly complete. It contains an introduction to the computer and explains the functions of all the keys, how to program in assembly language and some of the subroutines in ROM, along with some small programs that teach the use of these subroutines and the six-digit display. It briefly covers the theory of how the computer works, and contains schematics of the board. There is plenty of information on the Z-80 and the complete instruction set. Finally, there are some appendixes and a complete printout of the EPROM monitor program.

The last half of the manual contains a whole set of experiments, which were written by an English-speaking writer or by someone with more knowledge of the language.

The experiments were intended as a basis for a course on computers and thus can be of use in a classroom. Simple programming experiments help to familiarize you with assembly language; more complicated experiments

Address correspondence to Anthony T. Scarpelli, 82 Wellington Road, Portland, ME 04103.

cover stacks, arithmetic and logic, number conversions, the subroutines in ROM, the digital display, the keyboard and how to create a musical organ using the speaker and tone routines in ROM.

An additional section shows how to program and use the Z-80 CTC. There are no experiments on the Z-80 PIO, however, so other than one page in the appendix on programming it, you'll have to find other sources to gather information on this chip.

Though complete, the manual is only an introduction. It will teach you the basics of assembly language, but if you desire to go further, you'll have to refer to additional sources.

The Keyboard

The keyboard has 36 keys. It features not only the standard hexadecimal keys, but also the standard RS (Reset); Go, which starts your program; PC (Program Counter), which puts the program counter into the display; ADDR (Address), which allows you to enter an address into the display; +, which increments one address location; −, which decrements one address location; and DATA, which lets you enter a byte of data into the address displayed. The display has four address digits and two data digits slightly separated to the right.

The keyboard also contains keys that automatically trigger firmware routines in ROM, which takes some of the hassle out of programming in machine code without an editor/assembler.

For instance, have you ever tried to calculate the displacement values in relative jumps? I used to do the calculating with a circular slide-rule-type calculator. The Micro-Professor's RELA key prompts you for the start and destination addresses. When you press GO, it not only automatically does the calculation for you, but also inserts the value into the next address. This means that when you need a relative jump value while entering your program hex codes, just press a few keys to insert the correct value. If your values are out of range, -Err is displayed.

. . . Who knows? The MPF-I might take off and become the computer system of the future.

The keyboard also contains keys to

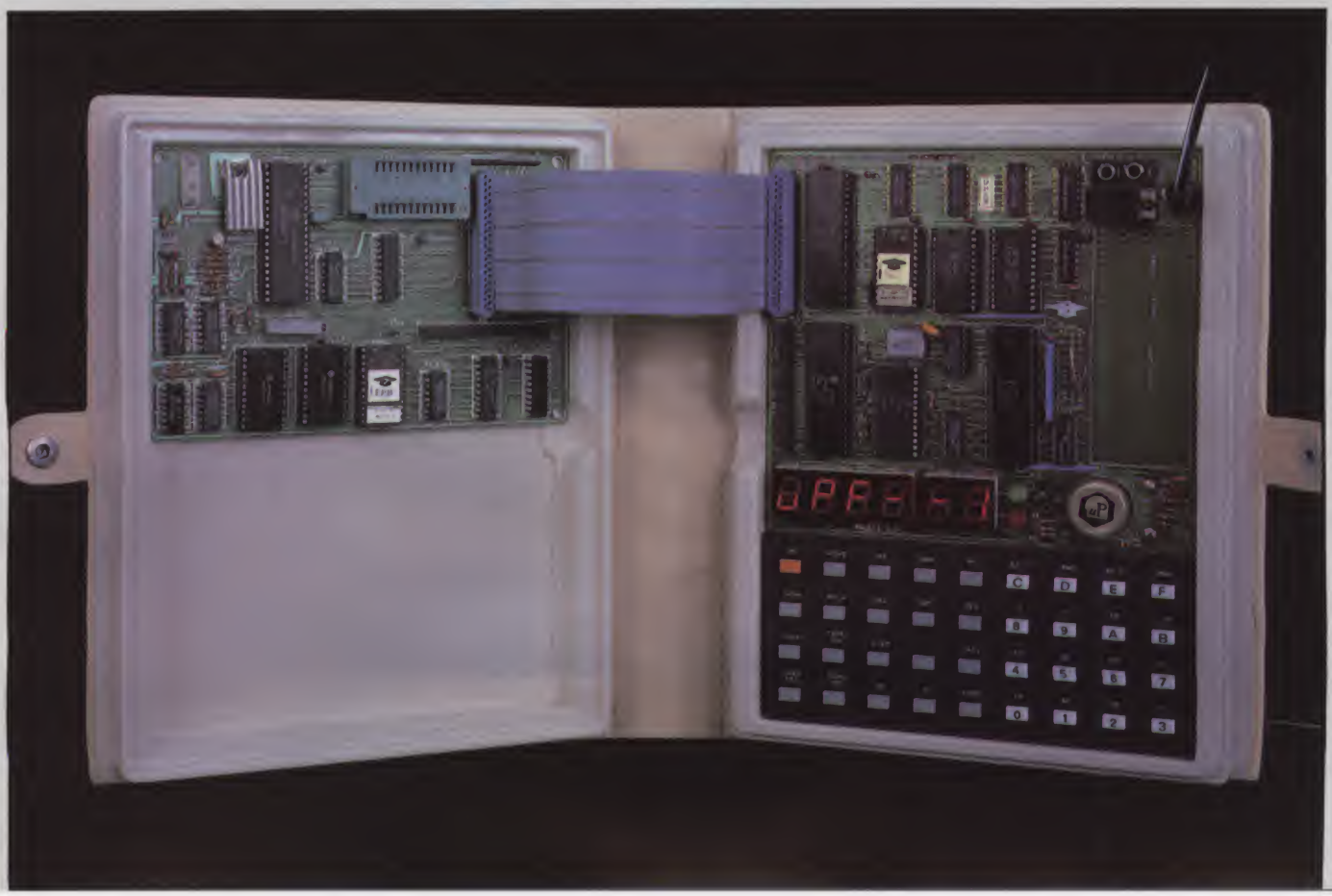
- move a block of memory from one address to another;
- write a block of memory to cassette and read it back;
- insert and delete a byte;
- set a breakpoint in your program for debugging;
- clear the breakpoint when you're finished with.

When you want to examine registers, press REG to view or change—via the hexadecimal keys—every one of the Z-80 registers, including the stack pointer, interrupt and flag registers. The exception is the refresh register, which you cannot view.

The STEP key lets you single-step through your own program or through the ROM program. The MONI key, which is connected to the Z-80 NMI (nonmaskable interrupt) pin, lets you override any program in operation and instantly sends you back to the monitor program. The RS (reset) key resets the whole system to its warm start routine.

A programmable INTR (interrupt) key is available when you issue an EI (enable interrupt) instruction, but of course you have to set up an interrupt routine to make use of this key.

The final key is the programmable USER key, available through one of



the ports of the 8255.

These available keys make programming and debugging much easier at this level. They are a nice feature that make the MPF-I easier to use.

The MPF-I is ready to go when you receive it, so just plug in the 9 V adapter. The monitor program automatically checks RAM and ROM after other system initialization, then scrolls uPF--1 across the display. It is now ready to program.

Problems

One of the first things I noticed when I turned on the MPF-I was that two segments in all of the digits of the display were always on together and dimmer than the rest. After a couple of hours of troubleshooting, I found a short in two pins of the display. Resoldering the pins cleared up the short.

It looked as if the board had been worked on before, since one of the display driver ICs was socketed and the other was not. Maybe someone else had looked for this problem.

I noticed another error when I was checking out the timing of the clock

How to Use MPF-I Programming Board

A handy option to purchase for the MPF-I is the EPROM programming board. With this $169 board, you can program any of the EPROMs listed in the EPROM table.

This board is about one-half the size of the computer board and is connected to the MPF-I via a 40-conductor cable.

The programming board also comes with its own power supply adapter, which provides nine volts and 30 volts.

The board contains an 8255 PPI, 4K of RAM, a 2K EPROM with the programming routines in it, a Textool zero insertion force (ZIF) socket, two voltage regulators, support ICs and components and two 40-pin connectors. One of the connectors goes to the computer during programming; the other is for system expansion if expansion is needed when using the programming board.

A keyboard overlay that fits nicely over the computer's keys comes with the board. Since some of the keys have their functions changed when in the programming mode, this card facilitates the programming process.

The Manual Again

The manual for this board is not as comprehensive as the one for the MPF-I, but it doesn't have to be. It is 42 pages long, and it covers everything you need to know to program an EPROM. Although it only briefly covers the theory of programming EPROMs, it completely covers the functions of all of the keys involved. However, it's so full of grammatical errors that it makes some of the instructions difficult to understand.

When I sat down to read the manual, I kept a pencil close by so that I could change the errors that I found. And there are plenty. I should say, however, that the errors are grammatical only; the information is mostly accurate. There is no listing of the program in the EPROM.

Using the Board

Programming an EPROM is simple to do. With the programming board connected to the computer with the 40-pin ribbon cable that is supplied and the power supplies plugged in, you can enter the programming restart mode by entering 9000 as the address and pressing GO. One of the keys is labeled RESTART, so you can get to this mode at almost any time.

Next, enter the number of the EPROM to be programmed and then press GO again. This sets the internal configuration for that EPROM and sets the 8255 for the correct voltages at the right pins. You can then enter the data into RAM, either by using the keypad or loading it from tape or by reading it off another EPROM via the READ key. After you press READ and GO, a successful read will display PASS-r.

Next, drop the EPROM IC into the ZIF socket and lock it in. Press the PROGRAM key to get into the programming mode. Then enter the start address, the end address and the destination address before pressing GO. The computer reads the RAM data into the EPROM.

It takes about 53 seconds to program a 1K EPROM. If the EPROM initially has any data in any location other than FF, the program will display FULL. However, you can still continue the programming if you want.

When the programming is finished, press the VERIFY key and, if necessary, the starting and ending addresses. Then press GO. if the data in EPROM is the same as in RAM, the screen will display PASS-U. If any address does not contain the same data, the display will first show the address of the bad data and then, after about a second, the data in the EPROM and the data in RAM.

You can tell if an EPROM is blank by first reading an empty socket, which puts all FFs into RAM, then installing the chip and verifying it. A new EPROM should also have FFs in every location.

The other key functions are LIST, which lets you check and modify memory, TAPE WR and TAPE RD, +, −, ADDR, DATA, INS, DEL and RS. These last nine operate the same as for the main monitor program.

The RAM addressing is performed at 0000 to 0FFF, instead of where the RAM actually is located, which is 8000 to 8FFF. Occasionally, I became confused as to what I should enter, especially when writing to tape. If you have to move a block of memory from lower RAM into the programming buffer when the normal monitor is being used, you have to specify the actual address. There is no block move when in the programming mode.

I also use the board to read and verify the 4K ROM chips from my TRS-80. If anything were to go bad with my ROMs, I would be able to program some 2732 or 2532 EPROMs with the ROM data. With slight modifications to the TRS-80 hardware, I'd be able to use the EPROMs. This would save considerable money, since the three-chip 12K Basic ROM set costs $150.

More Problems

Even this board was not problem-free. I measured one of the voltages used to program the EPROM at 27 volts. Since the specifications for this voltage on EPROM data sheets indicate an absolute maximum of 26.5 volts, I suggest that you check this voltage before doing any programming, since a higher voltage could damage the chip. You can measure with either an oscilloscope or a voltmeter by putting the board into the programming mode without an EPROM and checking either pins 20 or 21, depending on the EPROM selected. An adjustable voltage regulator and a control can be used to adjust its voltage on the board.

Another potential problem that could damage an EPROM exists. The programming pulse that one of the pins receives should be 50 ms ± 5 ms in duration. If the timing on the computer is off, this pulse could be out of range. Make sure the computer clock frequency is correct. This can easily be done with a time-loop or clock program.

Wrap-up

I found this board extremely easy to use. It takes just a few minutes to set up, enter in the data and program and verify an EPROM. Since the price of both the MPF-I and the programming board is as much as some EPROM programmers alone, these boards are a good deal. You are limited to certain EPROMs, though. If you needed to program a 2708 or a 2732A, for instance, you would not be able to do so without hardware modifications. You would also need to write your own program to do so.

So I would recommend purchasing the board if you want to program certain EPROMs quickly and easily. Also, you have an extra 4K of RAM available if you need it.■

A. Scarpelli

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program experiment, found later in the manual. The program was running more slowly than it should have been. It turned out that the actual board clock frequency was off. The 3.579 MHz crystal was actually running at 3.153 MHz, and it turned out to have a defective capacitor in the oscillator circuit. So if you use this board for any critical timing, such as EPROM programming, make sure your crystal frequency is correct.

Using the MPF-I

You need a cassette recorder to store programs, and writing to tape is a simple process. Simply press the TAPE WR key; enter in a four-digit file number, the starting address and ending address; make sure the recorder is in record mode; and press GO. You have to supply your own cable to the recorder. The signal level is for the mike input.

Loading from cassette is just as easy. Set the cassette volume control to maximum, press TAPE RD, enter the four-digit file number, press GO and hit the play button on the recorder. The monitor program will load only the file whose number was entered. If your recorder doesn't have a counter, then you may have to run through several programs to get to the one you want.

Since I've been using a high-quality recorder, I haven't experienced loading problems. Two different model recorders also worked well. However, I found that starting the load on anything other than the initial sync tone sometimes causes a bad load. The method the computer uses to load tape data is simple and effective, so the quality of the recorder should not matter.

If there are any errors on loading, -Err is displayed. It takes approximately one and a half minutes to dump or load 1K of RAM. If your recorder is good, the manual suggests changing the timing loop to do a faster dump. They do not go into detail as to how to do this, and I have not yet delved into the process myself.

RAMing It

Upon ordering the MPF-I, I opted for extra RAM at the same time. It's easy enough to put the RAM chip in its socket, but it will not work correctly if it's a 6116 until a jumper is moved. I overlooked this instruction on my first reading of the manual, so if you add RAM, *check the schematic* for the correct jumpers to connect and remove.

Although the monitor program automatically checks the RAM that comes with the board, it doesn't do so for any additional RAM. So when you add RAM, a simple project to try is to write a program to check this extra RAM and display any bad addresses.

How It Stacks Up

I've played with the MPF-I for a few weeks and have found it a lot of fun to use. If you're into assembly language, want to learn it or want to develop a computer control application, then I would recommend this board. It's easy to use, features special function keys and expansion capabilities, and lets you see and change all of the registers and single-step through a program. This is an exceptional computer for the price.

On the other hand, the problems with the MPF-I and the problem with the programming board (see sidebar) cause me to warn any potential buyer. Either there was a slipup on this one board, or quality control is lacking.

I couldn't find any other literature for this board, nor could I find any programs. If you want to go further, it's all up to you. For instance, I had to write my own tape-verification program to make sure that what is on tape is the same as what's in RAM. Of course, I used many of the routines in ROM, which indicates that the routines are not that difficult to understand or use. Such a routine could have been included in ROM, but I guess you can only get so much into 2K of EPROM.

You also have to want to suffer through writing assembly language programs in pencil. You have to learn to write short routines that later can be combined into a larger program. There is nothing like writing a page of code and then having to add a few lines right in the middle of it. Not only do you have to find room for it, but you also have to change all of the addresses in the rest of the program. This is why editor/assemblers were invented.

This board reminds me of the KIM-I, which was available for $245 back in the pioneer days of microcomputing—it is like starting at day one again. However, what you can get—an EPROM programmer, a speech synthesizer, a printer and a Tiny Basic interpreter chip, all at a really nice price—makes this a good entry-level machine. But you definitely have to be a machine language pioneer.

Yet, who knows? It might take off and become the computer system of the future.■

Surveying Storage Standards

In a follow-up to his May 1983 article "Mating a Winchester With a Controller," the author explores different media capacities to help you decide which storage route to take.

By Ken Barbier

In our May 1983 issue (p. 34), we looked at some of the problems that arose during the system integration phase of building a new computer system, the Discovery 500, from Action Computer Enterprises, Inc.

This multi-user desktop computer includes a 5¼-inch Winchester hard disk for mass storage. Double-sided, double-density mini floppy disks were chosen for data backup in this product. No problems occurred during the selection of the floppy disk formats, capacities and drives, due in large part to the use of a microcomputer-based "smart" disk controller.

Backing Up Hard Disks

In spite of arguments to the contrary, there is no one perfect medium for providing the necessary backup for the data stored on high-density hard disks with nonremovable media. For users with massive amounts of data to be updated daily, it is most convenient to record the entire contents of the hard disk on a backup device daily or weekly. This calls for one reel-to-reel or cartridge magnetic tape—or a whole pile of floppy disks.

The typical microcomputer user, however, will be happier with hard disk backup on a file-by-file basis. Only files that have been updated need to be backed up. A random access device, such as the floppy disk, provides a more convenient backup for individual files than does a sequential-access-only tape drive. And at a fraction of the cost.

The Discovery 500 is targeted for the low end of the multi-user computer market. With about a half-dozen users on the system producing accounting or word processing data or program source and object code, it is most practical for each user to be responsible for making backup copies of his own files whenever they are updated.

Final versions of program source code, or important text or accounting data, can be backed up on two copies—one for the individual computer user and one for the company archives. This is most easily accomplished by using floppy disks.

Mini-floppy Capacities

Writers using word processors, or computer programmers generating source code, will produce a maximum of 20,000 to 100,000 characters (bytes) of data per day. The mini floppy format that is becoming an industry standard provides for 160K of storage on one side of a 40-track disk. This capacity is probably adequate for a single-user computer.

Without changing the format of the data written onto each track of the disk, this capacity can be increased to 320K by using double-sided disk drives, and on up to

Format	Type	Bytes/ Sector	Sectors/ Track	Capacities (1)
1	FM	128	16	80K, 160K, 320K
2	MFM (2)	256	16	160K, 320K, 640K
3	MFM (2)	512	8	160K, 320K, 640K

Notes: 1. Capacities are for single-side 40 tracks, double-side 40 tracks and double-side 80 tracks.
2. Variations of double-density (MFM) formats include single-density (FM) on track 0 only for booting up on dual-density controllers.

Table 1. Mini floppy disk track formats. The DTC-520A smart disk controller provides for the selection (under software control from the host computer) of a number of different disk track formats, providing compatibility with many computer systems.

Parameter	Unit	Typical Value	Result
Step Pulse Width	1 μ	6	6 us
Step Interval	10 ms	3	30 ms
Max Cylinder		79	80 tracks
Head Settling Time	1 ms	20	20 ms
Head Select Delay	1 μ	200	200 μs
Drive Select Delay	1 ms	250	¼ second
Write Gate Delay	100 μ	1100	1.1 ms

Table 2. Assignable mini floppy disk drive parameters. The disk controller can be down-loaded from the host computer with parameters defining the performance of the floppy disk drives, as was true for the hard disks. This permits a wide selection of single- and double-sided drives with either 40 or 80 tracks per drive.

Address correspondence to Ken Barbier, PO Box 1253, Borrego Springs, CA 92004.

640K by using double-sided, 80-track drives. The latter size is incorporated in the Discovery 500, thereby providing about ten user-days of backup on each $4 disk.

Moving Toward Industry Standards

In the computer world, technical standards always have been established by the biggest companies in the industry, simply by delivering large quantities of hardware or software products. Institutes, associations and societies may think that their committees are generating the standards, but they're only following those dictated by the leading companies. And we know who the leader in the computer world is!

Before the IBM Personal Computer, there were altogether too many different recording formats used on mini floppy disks. The race for more capacity produced exotic recording techniques that provide for more than a million characters of storage on a single disk. It's interesting that "Big Blue" delivered its first personal computer with only 160K of disk storage, while others were already delivering a megabyte. Could the deciding factor have been reliability?

Whatever the reason, the moderate per-track recording density used on the IBM PC can be multiplied by doubling the tracks per side and number of sides recorded to produce the respectable 640K-per-disk capacity mentioned above.

Even IBM has entered the capacity race; it now offers the 320K option. I wouldn't be surprised to see this doubled again in the near future.

Downward Compatibility

The Data Technology Corp. DTC-520A disk controller used in the Discovery 500 can control up to four 5¼-inch drives—two of which can be hard disks. For the floppy disk drives, a variety of recording formats and drive configurations are made available by this "smart" controller under software control from the host computer. Among the track format options is one compatible with the IBM PC recording standard.

That format provides for dividing each track into eight sectors, each storing 512 bytes of data. This format option can be established in the DTC-520A by a command from the host computer. The controller then can be issued the disk drive parameter definition that tells it how many tracks there are per disk side (40 or 80), and how many sides are available (one or two). This provides for the optional selection of 160, 320 or 640K disk capacities.

While the default selection for the Discovery 500 is the 640K capacity, the flexibility provided by the smart disk controller makes it possible to temporarily select the other options for the purpose of reading or writing the smaller capacities, to provide for program and data exchange with other computers.

Bootup, Backup and Transportability

Combining a floppy disk drive with a fixed media hard disk in a microcomputer system provides for more than just data backup. In the unlikely event that the hard disk drive should fail and have to be replaced, software that provides for booting up the operating system from the floppy instead of the hard disk is available on floppy disk.

Utility programs on the system floppy disk then provide for the formatting and testing of the new hard disk, and the reloading of the system programs onto it. Then each user can reload the hard disk with all of his files from the carefully prepared backup disks and normal operation is resumed.

Updates to system software—as well as to new programs recorded on mini floppy disks—can be easily mailed to computer owners. Using a smart controller like the DTC-520A also enables the users to select temporarily other disk formats for transporting files between different makes of computers. These functions would, of course, be difficult or impossible if the only backup medium was a tape drive.

By combining the best features of 5¼-inch Winchester drives, mini floppy disks and S-100 bus-compatible processor boards designed specifically for multi-user computers, it was possible to put together a high-performance multi-user computer in a single desktop-size package, providing a significant amount of mass storage, backup for that mass storage and the medium for intercomputer data exchange. ■

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Is a Fortune in Your Future?

Using the powerful MC68000 chip and the Unix operating system, the Fortune 32:16 is designed for the professional who needs more than what a personal computer affords. The San Francisco Giants are finding the Fortune handy—the team's scouts use it to circulate information on promising ballplayers.

By Ned Hamilton

Boy, was I mad! I had just spent a small fortune for a computer that was supposed to be fast, but it was slower than the Imsai that I built six years ago. It took a lot of frustration and time to find out why the computer was so slow. The retailer and even the manufacturer seemed confused.

The problem eventually was corrected, but before I get into that, I should explain a little about the computer, the Fortune 32:16. (Relax, this isn't going to be a detailed review with exhaustive price lists and technical discussions. Rather, I'm going to describe some of the features and shortcomings of a product that promises to incorporate more advanced thinking into the desktop computer field.)

Fortune Strategy

In order to appreciate the Fortune 32:16, you've got to understand the strategy behind its design. This isn't just another desktop computer. (It exceeds the personal computer in both cost and function, so I'll call it a desktop.) It's a machine that can perform equally well as a dedicated word processor, a powerful computer, a professional communicating workstation with graphics and an integral part of a multi-user network.

Obviously, no computer can be all things to all people, but if the basic hardware and software are well-thought-out, a computer can perform many different functions amazingly well.

The hardware and the software both have been chosen with this integrated system concept in mind. The software uses a Unix-like operating system that has been enhanced by Fortune to be extremely user friendly (more about that later). The hardware theory was to supply a product that can be added to—to go from single-user to a multi-user network with few growing pains.

The Hardware

It's called Fortune 32:16 because it performs arithmetic inside the microprocessor chip on numbers that are 32 bits wide, yet it passes data to and from the chip with numbers that are 16 bits wide. The chip—the main processor or CPU—is a powerful one: the Motorola MC68000.

The 68000 chip differs from those used in the IBM Personal Computer and Apple II in the size of the numbers inside the chip and the numbers passed to and from the chip.

The IBM uses an 8088 chip, which has 16-bit internal numbers and eight-bit input/output. The Apple II 6502 chip has eight-bit internal numbers and eight-bit I/O. Usually, a processor of 32-bit size is faster than a 16-bit processor, and a 16-bit chip is faster than an eight-bit chip.

Of course, the bit size of a chip isn't the only factor influencing a chip's speed. The instruction set also plays a big role in speed.

More importantly, the instruction set determines how flexible a chip will be. The first microprocessor chips had about 100 fairly simple instructions. The newer, more sophisticated chips, such as the 68000, have a rich mixture of several hundred instructions.

Stepping Outside

Enough about the chip architecture. . . let's step outside the box.

Address correspondence to Ned Hamilton, PO Box 1501, Lafayette, CA 94549.

The Fortune's 99-key keyboard features a 15-key numeric pad, a nine-key cursor-control pad, 16 programmable function keys and a full set of system level function keys.

One of the most impressive things about the Fortune is its attractive appearance. The cosmetics seem to have been as carefully thought-out as the hardware and the software.

This is a new trend. The more technically oriented companies pay little attention to the appearance of their units; this is shortsighted, because a system sells better if it has sex appeal.

The basic unit comes with a CRT monitor, a CPU about the size of a large briefcase, and a keyboard. The CPU connects to both the keyboard and the CRT with coiled cords, and the CRT tilts and swivels. This allows physical configurations to suit almost any taste.

The CPU comes with either one or two flexible disk drives or with a hard disk drive and a flexible disk drive. The flexible drives have a capacity of 800K each, and the hard disk drives come in 5M, 10M or 20M sizes.

The CPU unit contains five slots for memory boards. It can hold up to a megabyte of memory and an error-correcting board. The CPU has five additional slots for I/O and controller boards.

The keyboard is the most unusual feature of the Fortune. It has 16 programmable function keys and a "help" key. It also has four keys primarily used for word processing, as well as a cluster of cursor movement keys and a numeric keypad. Plastic inserts can be slipped beneath the row of function keys to serve as labels and to customize the keys for each application program.

A unit consisting of a CPU, CRT and keyboard can serve as a central station to support auxiliary terminals. Each Fortune terminal has its own microprocessor (a Z-80) with 64K of memory within the terminal.

A central unit can also serve as a link in a network connected to other processors, other computers, file servers, modems or mainframes. All of these extras can be added to the basic unit without an overhaul of the software or a rebudget for a new system.

A typical Fortune system might contain the main unit and three or four terminals. You'd need about 1M of memory for top performance. You'd probably also need a 20M hard disk. (Although that seems steep, remember that this is a Unix system, and Unix requires a lot of space. The operating system alone takes 100K and the word processor and spreadsheet programs each take upwards of 100K of memory.)

This typical system's costs would be about $11,000 for the main station with 20M of hard disk storage, a few hundred dollars for an I/O board and $1100 for each terminal. This would be a powerful system with capabilities of running simultaneously, in multi-user mode: word processing, spreadsheets, program development, database operations and accounting packages.

Theoretically, the Fortune CPU can support many terminals. Practically, though, you'll start to lose speed if more than four users are on at once. Of course, it depends on the users' activities. If the users are doing database or program compilation work, a practical limit might be three users. If the users are doing keyboard I/O (which is relatively slow to a computer), the limit might be eight users.

Options on the Way

Many options will soon be available for the basic Fortune system. Your choices will range from parallel I/O boards to Ethernet controllers to bit-mapped graphics boards to magnetic tape boards. In addition to the standard 25-line by 80-character CRT, a 60×132 CRT is planned. (Currently, **only a few options are available. Many of the other goodies should be ready by the time you read this review.**

These options will give the Fortune its unique flexibility. The system can serve as a computer, a word processor, a network and a graphics output device, among other things.

Of course, no single machine will have all of these features, but one organization can have several Fortunes doing different tasks. The advantage is that the use of a common language and common protocols will be possible. You don't need a Wang for word processing, an IBM to do spreadsheets and a DEC VAX to serve

The Fortune 32:16 system is a computer, a word processor, a communicating workstation with graphics, and a part of a multi-user network.

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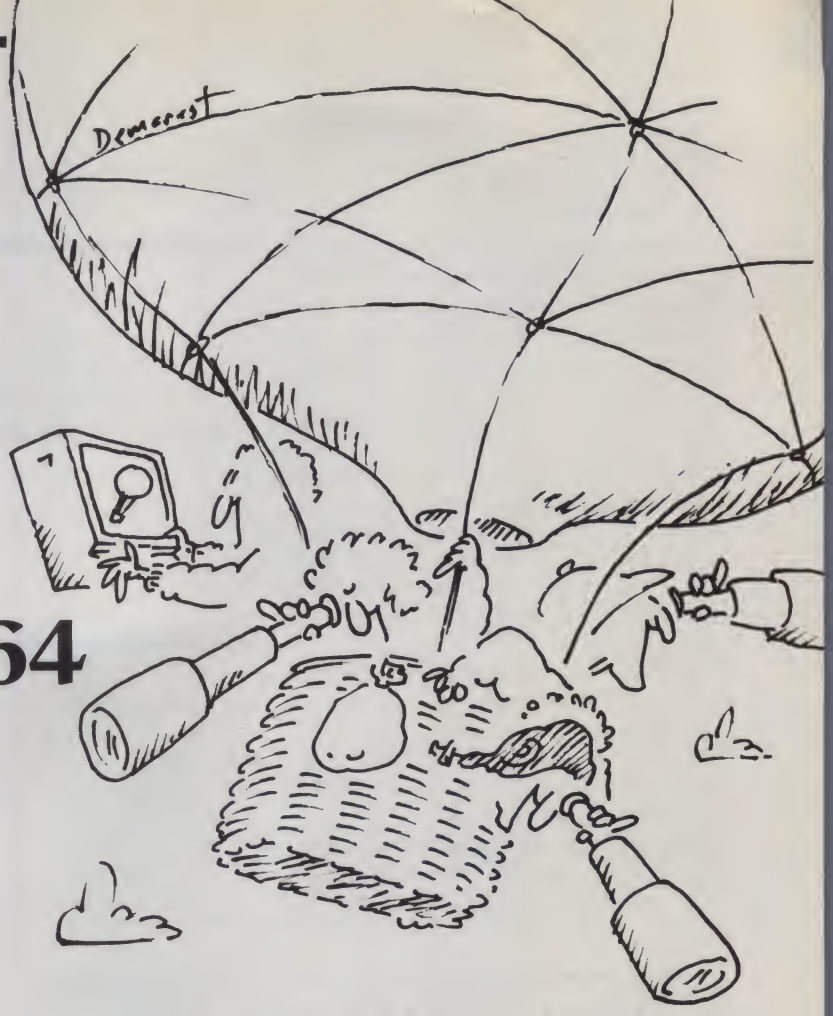

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several programmers. Fortune systems can do all of these things and still talk to each other. And most importantly, the user doesn't have to learn two or three different systems.

The Software

Fortune's operating system is based on the Unix system. Fortune has taken Unix and "wrapped" around it a friendly, easy-to-use shell. You've got the best of both worlds—the flexibility of Unix for those who need it and the ease of use of the menu-driven Fortune enhancement.

The Fortune shell menus rely on the underlying Fortune version of Unix. Those of you who are familiar with CP/M but not with Unix would benefit from trying the Fortune with someone who knows how to demonstrate Unix.

Because of its great flexibility, Unix is unavoidably an extremely technical operating sytem. It offers "pipelines," I/O redirection, command files (similar to the submit features in CP/M) and a slew of other tools.

Suppose you want to send two separate files to another user on a multi-user system. Say you also want the files to be stamped with today's date and you want a printed record of what you sent to the other user. Unix is so powerful that a single typed line of three commands could do this. (Some Unix users could figure out a way to do this with two commands.)

> You've got the best of both worlds—the flexibility of Unix and the ease of use of the menu-driven Fortune enhancement.

If you wanted to do the same thing with CP/M, you'd have more difficulty. First of all, you'd have to be on a multi-user system if you wanted to send a message to another user; being on a multi-user system in CP/M means that you would actually have to have one of the multitasking versions of CP/M.

The procedure to send the time-stamped files and the hard copy back-up would depend on the system used. Most systems would require that a temporary file be created first. Then, with two commands, you could send the file to the user and make the hard copy. Some CP/M systems would not be able to time-stamp the files. And, to do a complete job, you would want to erase the temporary work file.

There is a price to pay for all of this Unix flexibility. The system places a tremendous burden on the computer's speed. Unix uses the disk a lot and takes up a great deal of space in memory. (Until recently, no one has tried to run a Unix-type system on a smaller-than-16-bit computer.)

There is another price to pay: Unix's flexibility requires that it be precise and abbreviated and that it offer few error messages. This means that the user has to be familiar with Unix to get maximum use out of it.

That's where Fortune comes in. Fortune's producers retained the Unix features and added a higher-level, menu-driven shell. The shell works

like a menu in a restaurant: it lists all the functions that are available. You pick out the function you want, and the computer either does it or responds with a more detailed menu. This way, a series of menus can be "paged" past you on the CRT screen, with each menu becoming more detailed. The result is that you don't have to remember all of the options of Unix; the menu *shows* you all of the available options.

In the same way that you pay a price for the power of Unix, you also pay a price for the friendliness of the Fortune shell—it's much slower than using Unix commands directly. For example, to list the names of a few files takes about 2.7 seconds with Unix (if there are ten or 20 files). It takes 2.6 seconds to process the command and about a tenth of a second to display on the CRT screen.

With the Fortune shell, the same listing operation takes 4.5 seconds. In this case, the additional 67 percent of time is required by the Fortune shell to process the command.

Applications Software

The availability of applications software is the key to the success of any computer. Happily, there are a lot of powerful programs available for the Fortune. The programming languages include Basic, Fortran, Cobol, Pascal and C. Application languages are available for database operations (Idol and Sequitur), accounting (order processing, accounts receivable and payable, payroll, fixed assets and general ledger) and of course word processing (For:word) and a spreadsheet (Multiplan).

> The word processor and the spreadsheet programs surpass anything I have seen in the microcomputer field.

Many of these programs are not yet available. And others should not have been made available! An example is Basic; usually, Basic languages come in two versions—the faster compilers and the slower interpreters.

Because Fortune's Basic is in interpreter form (and probably because the Basic has not been optimized for Fortune), the language is embarrassingly slow. Also, the Basic manual has numerous errors; it should have stayed in the lab for more work.

The accounting packages are systems that have been around for a while and are widely used. Their chance of success depends on the modifications that were made to adapt them to the Fortune computer.

The word processor and the spreadsheet programs, on the other hand, surpass anything I have seen in the microcomputer field.

The word processor, For:word, is modeled after the successful standalone word processor, the Wang; Fortune's keyboard and protocol are especially similar. And like many other popular microprocessor word processors, For:word is screen-ori-

ented (what you see on the screen is what you get).

In the designing of other microcomputers, the word processor function usually is not given much consideration. So when the word processor software comes along, compromises must be made to get things done.

For example, to insert text usually requires that you type a control key sequence. This means that the operator has to remember a lot of codes and often has to press two keys to do one job. The Fortune has keys that are dedicated to each of the major word processing functions. To insert text on the Fortune, you press the insert key, then the text key, then the execute key.

Other features include a useful glossary function and fast indexing. You can go from the index to the editing mode with only a few key strokes—without having to type in the name of the file. Obviously, the word processor does all of the common jobs, like margin justification, centering, proportional spacing and subscripts, as well as some uncommon jobs, like bookmarks, headers, decimal tabs and help screens.

The spreadsheet program (Microsoft's Multiplan) is the most powerful that I have used. It combines the best features from VisiCalc and SuperCalc and still runs fast. The Microsoft people have added several enhancements: centering within a column, additional arithmetic functions, cell naming, windows and command anticipation.

My favorite features are Multiplan's windows and its command anticipation. The window function allows you to chop up a large spreadsheet into as many as eight separate windows. These windows can be scrolled together if desired. This allows the display of small working portions of a spreadsheet or the display of column titles when you're at the bottom of the sheet.

The command anticipation feature is just as useful. Suppose you're putting the same formula across a sheet for 12 columns, and suppose you have to repeat this for several rows. Once you have copied the first row for 12 columns, the copy command retains the number 12 so that it doesn't have to be typed again. If you don't want to use the number 12 on the next copy command, you simply type in the number you want on top of the 12.

Because of Fortune's keyboard, Multiplan performs better than on most microcomputers. As is the case with word processors, most systems require control codes to do certain functions. Fortune's dedicated keys eliminate the need for control codes.

The indexing is particularly handy. If you're loading a spreadsheet and you're not sure of the exact spelling of the file you want, simply hit a cursor key. The entire spreadsheet index appears and you can move through it with the cursor keys. When you've found the file you want, hit the execute key and the file will load.

The file-loading is incredibly fast with a hard disk drive. A spreadsheet with over 3000 cells loads in about two seconds. A recalculation of a sheet with 3000 cells (where every cell depends on another cell) takes about 1.5 minutes.

The Growing Pains

The Fortune 32:16 is a new computer from a new company. The staff is made up of people who have proven themselves at least once in the data processing field. The management roster reads like an alphabet soup of alumni from IBM, RCA, GE, TRW, Memorex, ITEL, and so on. They know that any system start-up requires infinite patience and omnipotent scheduling abilities.

Frankly, I think the gang at Fortune, as experienced as they are, probably didn't anticipate all of the problems they're having. Overall, they've done a reasonable job of getting a complicated system out with a minimum of delay and problems, but there are some serious bugs.

In my opinion, the company's most serious problem is its failure to communicate with the users. Many of the early bugs in the system turned out to have simple solutions. But because Fortune did not communicate these problems, the users were left in the dark; they had to discover the same bugs over and over again.

What got me so mad was the initial performance of the computer. The adaptation of Unix to the Fortune, I have been told, has not yet been "fine-tuned." Also, a feature added by Fortune to avoid power-failure back-up turned out to put a heavy drag on the system's speed. The result is that a system with 256K of memory is slow. The operating system is slow, the word processor is sluggish and the spreadsheet is essentially unusable. And the multiuser version is so slow that it cannot be used with less than 512K of memory.

Fortune's interim solution (until the operating system can be optimized) is to add memory. The resulting speed change is like going to "warp" drive. The operating system speeds up by a factor of two or three and the word processor and spreadsheet programs become immediately responsive. With 768K of memory, three or four users can be handled comfortably, without the long delays that occur with smaller memories.

The point here is that Fortune did not respond to this speed problem immediately. At first, the company denied it; it took a long time before Fortune would "broadcast" the memory fix to users.

Another serious bug is the lack of handshaking for many printers. There is no hardware handshaking and the only software handshaking is the XON/XOF sequence recognized by many, but not all, printers.

If your printer doesn't use XON/

A Capsule Look At the Fortune 32:16

Manufacturer
Fortune Systems Corp., 1501 Industrial Road, San Carlos, CA 94070; phone 415-595-8444.

Base List Price
$4995 for minimum configuration.

Standard Features
Motorola MC68000 microprocessor with 32-bit data and address registers, 24-bit memory address bus, 16-bit data bus and 16M linear address space; 128—1M RAM; 4K—15K ROM; RS-232C serial interface; flexible disk controller that supports up to four flexible disks. Magnetic storage includes one to four 720K formatted 5¼-inch floppy disks, 5M, 10M or 20M of 5¼-inch hard disk storage and one to four eight-inch hard disks as a back-up system; 12-inch, nonglare, black and white monitor with optional color filters; vertical tilt from +15 degrees to −5 degrees and horizontal swivel of 90 degrees; 80×25 screen; 99-key removable keyboard.

Proportions
System weighs 48 pounds (12-pound monitor, six-pound keyboard and 30-pound processor). Monitor measures 12.9×13.7×12.3 inches; keyboard is 2.2×6.3×22.3 inches; processor is 5.8×13.9×22.3 inches.

Software
Based on Unix, Fortune's operating system includes multi-user/timesharing system; file management system; comprehensive utility set and multiple-language and communications support. Fortune speaks Basic, Cobol, Fortran, Pascal and C.

Applications
Business accounting system, database management system, word processing system, Multiplan professional system and graphics system.

XOF, it must be run slowly so that its buffer doesn't fill up. This usually puts a speed limit of about 30 characters per second on the printer.

So far, most of the other bugs are minor but irritating. For example, a Unix system has the ability to run several processes at once in order to do such things as printing or running a program in background at the same time a foreground program is running. Occasionally, these background processes run wild or "hang up."

Fortune's version has omitted a common Unix command that allows the user to see what processes are running. Without this command you don't know which processes may be causing problems and which have to be stopped. The only solution is to turn off the machine.

Fortunately . . .

All in all, the Fortune 32:16 is fast—as long as you have enough memory. *The machine is flexible*—both the software and the hardware have been carefully chosen to ensure that.

And you can count on any Fortune bugs to be exterminated; it comes from a sound company. Fortune reportedly raised more capital, faster, than any previous venture-capital startup.

Fortune's management has a vision of a desktop computer that can readily serve as a communication tool and a data processing tool. One version of the system will be suitable for managers, another version will be suitable for programmers, while a third will be suitable for writers, while a fourth . . .

Many small-computer makers don't bother to match the software and the hardware, but that's not so with Fortune. The company has carefully coordinated the two areas, and they haven't ignored how this coordination will wear in the future.

The Unix software, because of its popularity in colleges, opens a large world of loyal and competent followers. The 68000 chip offers a fast processor with a guaranteed long line of descendents. The integrated system concept ensures that you can add to the system without earlier pieces becoming obsolete.

The Fortune costs more than a personal computer, but it's not aimed at the personal computer market. It's a professional tool designed to do complicated things and to do them fast. It should be able to quickly establish a niche for itself in the marketplace.■

Atari Number Roundup

Neatness counts when it comes to printing columns of numbers with the Atari. Shape up your columns with this Basic formatting progam.

By Steve Fabac, Jr.

If you use your Atari 400 or 800 for anything other than games, sooner or later you will come up against the problem of generating neatly spaced columns of figures as output. Aesthetics aside, neatly aligned columns are easier to scan quickly, thus speeding comprehension of the printed data.

Common Basic Problem

The problem is common to most Basic-in-ROM operating systems and occurs when the print command is executed. Atari's operating system puts the information on the screen starting at the current cursor location. Thus, as the magnitude and number of decimal places vary from line to line, the left edge remains fixed and the right edge gets ragged.

In cases where several columns are required, the problem is compounded when numbers in the first column affect the alignment of successive columns, causing a jumbled table.

Adding to the problem are numbers that the operating system has computed to nine significant places. Printing 1/3 as .333333333 is no surprise except when you have changed the default tab spacings to squeeze more columns of information across a 40-character screen. The unguarded occurrence of repeating fractions can play havoc with a compact table of data.

Some extended Basics, such as those utilized in Hewlett-Packard desktop computers, offer formatted printing in the style of FORTRAN IV. In addition to the common print statement, Hewlett-Packard provides a write statement (select code and format number) that utilizes a line-numbered format statement. Coding such as

```
100 WRITE(15, 110) A,B
110 FORMAT F8.2," Dollar balance in account
    number ",F3.0
```

causes the value of A to be printed in an eight-character-wide print field with two decimal places, followed by the characters between the quotes and the value of B in a three-character-wide print field with no decimal places.

Alas, Atari Basic does not offer this enhancement. However, it's possible to do a pretty fair job of formatting the screen using Basic statements (see Fig. 1).

Formatting Requirements

Basically, formatting output into columns requires that you define the print field width and the number of decimal places to be printed, that you determine the required number of character positions (including the decimal point) needed to display the expected numeric range of data to the required precision, and that you position the cursor to the correct spot on the screen.

When this is accomplished, the cursor is prepositioned and the least-significant digit of the printed number aligns with the predetermined horizontal character position.

To accomplish the formatting of the screen, it's necessary to examine how Atari will print numbers.

1. Positive integers are the least demanding; they occupy character positions one-for-one with the number of decimal decades.
2. Negative integers require one additional character position for the unary operator "—."
3. Numbers between zero and ± 1 are prefixed with "0." (zero, decimal point) with this exception: all numbers smaller than 0.01 are printed in scientific notation (1.0E-02).
4. Zero is always printed as "0," one character wide.
5. All integers larger than nine decimal decades are printed in scientific notation.

Now, let's examine the easiest case to implement: positive integers. Three

SAMPLE PRINTOUT

NORMAL ATARI	FORMATTED
94691.56	94691.56000
137.877014	137.87701
21.47497558	21.47497
144.42514	144.42514
110911.4868	110911.48680
12731.925	12731.92500
1142.399597	1142.39959
7074.012954	7074.01295
15.25726318	15.25726
2009.010772	2009.01077
38.47790526	38.47790
1064.997878	1064.99787
3459.11444	3459.11444
6.46862792	6.46862
79632.0385	79632.03850
16391.5436	16391.54360

Fig. 1. Example of normal Atari vs formatted printout.

Address correspondence to Steve Fabac, Jr., 910 East 5th Terrace, Lee's Summit, MO 64063.

features of the Atari operating system simplify the task: the floating point arithmetic package, the logical operators and the operating system graphics package.

To determine the number of places necessary to express any positive integer, we can use the base-10 logarithm function CLOG. The statement INT(CLOG(X)) will result in a number corresponding to the exponent of the value of X expressed in scientific notation. Thus, INT(CLOG(100)) results in 2 and INT(CLOG(1000)) results in 3.

Since the number of decimal decades in the range of 100 to 999 is three, the result of 2 obtained above may seem to be inadequate at first. However, it fits in nicely with the cursor positioning available on the Atari.

"Despite its lack of speed, this useful program will satisfy a large percentage of your programming needs."

```
10 DIM P$(9),OV$(12),UV$(12)
15 OV$(1)="+":OV$(12)="+":OV$(2)=OV$
16 UV$(1)="-":UV$(12)="-":UV$(2)=UV$
20 DATA 104,165,18,166,19,164,20,141,158,7,142,159,7,140,160,7,96
30 FOR I=1 TO 17: READ X: POKE1953+I,X: NEXTI
80 FMT=29000:PTC=29095:TRNC=29300
90 PRINT "ENTER FIELD WIDTH";:INPUT FW
100 PRINT "ENTER NUMBER OF DECIMAL POSITIONS";:INPUT DP
105 REM *** READ TV FRAME COUNTER ***
110 X=USR(1954):T0=PEEK(1952)+256*PEEK(1951)+256*256*PEEK(1950)
115 REM *** GENERATE 100 RANDOM NUMBERS ***
120 FOR I=1 TO 100:A=RND(X)*1000
125 REM *** FORMAT AND PRINT ***
130 GOSUB TRNC:GOSUB FMT
135 IF INT(I/3)=I/3 THEN PRINT
140 NEXT I
150 PRINT:X=USR(1954):T1=PEEK(1952)+256*PEEK(1951)+256*256*PEEK(1950)
160 MIN=INT((T1-T0)/3600):SEC=((T1-T0)-(MIN*3600))/60
170 PRINT:DP=1:A=SEC:PRINT MIN;" MIN ";:GOSUB TRNC:FW=(INT(CLOG(X)))+4:
GOSUB FMT:PRINT " SEC "
180 END
29000 REM *** FORMAT PRINT ***
29010 IF X=0 THEN POKE85,PEEK(85)+(FW-1)-((DP+1)*(DP<>0)):GOTO 29060
29020 SIZE=INT(ABS(CLOG(ABS(X))))
29025 IF SIZE>=(FW-2) OR (ABS(A)<1 AND FW-DP<3) THEN PRINT OV$(1,FW);:R
ETURN
29026 IF ABS(A)<0.01 THEN PRINT UV$(1,FW);:RETURN
29030 IF X<0 THEN POKE 85,PEEK(85)-1
29040 IF X=INT(X) THEN POKE 85,PEEK(85)+(FW-1)-(SIZE+(1*(DP<>0))+(1*(SIZE
<DP)))
29050 IF ABS(A)<1 THEN POKE 85,PEEK(85)+1+(INT(CLOG(ABS(A))))
29060 PRINT X/FACTOR;:GOSUB PTC:PRINT P$;:RETURN
29095 REM *** PACK P$ ***
29096 PNT=0:P$="":ON DP GOSUB 29240,29200,29160,29120,29100
29097 RETURN
29100 IF INT(X/100000)=X/100000 THEN P$=".00000":RETURN
29110 PNT=1
29120 IF INT(X/10000)=X/10000 THEN GOTO 29140
29130 PNT=1:GOTO 29160
29140 IF PNT<>1 THEN P$=".0000":RETURN
29150 P$="0000":RETURN
29160 IF INT(X/1000)=X/1000 THEN GOTO 29180
29170 PNT=1:GOTO 29200
29180 IF PNT<>1 THEN P$=".000":RETURN
29190 P$="000":RETURN
29200 IF INT(X/100)=X/100 THEN GOTO 29220
29210 PNT=1:GOTO 29240
29220 IF PNT<>1 THEN P$=".00":RETURN
29230 P$="00":RETURN
29240 IF INT(X/10)=X/10 THEN GOTO 29260
29250 RETURN
29260 IF PNT<>1 THEN P$=".0":RETURN
29270 P$="0":RETURN
29300 REM *** TRUNCATE AND ADJUST INPUT NUMBER ***
29310 GOSUB 29400
29320 X=INT(A*FACTOR):RETURN
29400 FACTOR=INT(10^DP)+1:RETURN
```

Listing 1. Program for formatting numeric output on the Atari 400 or 800.

Location 85 in memory is the low byte of the two-byte "current cursor location" register. Because the Atari provides graphics modes with up to 320 horizontal positions, *the two-byte* register is required. But since the text mode (Graphics 0) is only 40 characters wide, we need only to poke to location 85 to position the text cursor anywhere along the current line.

Suppose that we want to print the number 1000 in a ten-character-wide print field. If we examine the screen, we find that the cursor is located at the first available character position on the current line, whether it's at the beginning of the line or whether it comes after printing other data and suppressing the "new line" with a semicolon.

Furthermore, we find that there are nine character positions after the cursor that comprise the ten-character-wide print field. If we take the desired field width and subtract 1, and add that intermediate result to the contents of location 85 and then poke the result back into 85, the operating system will position the cursor to the last character position in our desired print field. (Note that the cursor will not actually move until a screen I/O is executed.)

Now subtract the result of INT (CLOG(1000)) from the value stored in location 85 and poke the result back into 85. The operating system will move the cursor back three character positions. Thus, when 1000 is printed, the last 0 will occupy the right-most character position of the specified print field.

With that, we can write a statement to perform the necessary calculations:

```
POKE85,PEEK(85)+(FW-1)-(INT
(CLOG(X))):RETURN
```

This statement will do the job for any positive integer that will fit into the specified field width, with the exception of very large integers (scientific notation, remember?) and 0.

Unless you check for 0 and handle it separately, you'll receive an error message saying that the cursor position is out of range. This is because requesting CLOG(0) is an error, and on my Atari it returns −129.4735290, which is clearly of no use in formatting anything.

Logical Evaluation Features

This is where we can use the logical

evaluation features of the Atari. The statement can be rewritten as:

```
POKE85,PEEK(85)+(FW-1)-(INT(CLOG(X))*
(X<>0)):RETURN
```

As long as the value of X does not equal 0, the expression (X<>0) is true and evaluates to 1, and any number multiplied by 1 is unchanged. But when the value of X is 0, then (X<>0) is false and evaluates to 0, and any number mulitplied by zero is zero.

In the case of negative numbers, it is customary to print a minus sign immediately before the most significant digit. Once again using logical operators, the above statement can be rewritten to include this term: $-(1*(x<0))$. This has the effect of adding one more character position to the size of the number to take care of the minus symbol.

That brings up a point you should remember: the field width that you specify should always be a minimum of one decade larger than the largest number you expect to print.

This requirement is necessary because all formatters must reserve the most significant character position in the print field for the sign of the number. (In the case of positive numbers, the sign is understood to be + and normally is not printed.) In this way, the formatter ensures that adjacent columns will always be separated by a space or minus symbol.

To implement this strategy, the formatter must test the size of the number against the specified print field width prior to poking to location 85. If the number is found to be too large to fit, the formatter then fills the print field with a string of plus symbols.

Integers are fine, but if your program deals with amounts of money, you'll need two decimal places to be generally acceptable. Listing 1 is a demonstration program that will allow you to select up to five displayed decimal places to the right of the decimal point by setting variable DP prior to calling Gosub 29000.

In addition to the formatter coding, the program contains a short assembly-language routine to read the TV frame counter in memory locations 18, 19 and 20. As listed, the program will print 100 random numbers in three columns and the time it takes to do it. (Fig. 2 is an example of the output using a field width of 8 with two decimal places.)

```
ENTER FIELD WIDTH?8
ENTER NUMBER OF DECIMAL POSITIONS?2

  13.32  585.26  270.52
 391.61  623.36  942.10
  93.78  380.09  892.04
 121.94  421.34  731.52
 918.18   94.75  179.13
 537.39  935.95  825.82
 364.78    7.43  386.09
  61.92    0.56   60.80
 196.02  452.34  766.25
 962.81  525.08  405.51
 664.27  570.28  649.18
  93.81  773.36  835.20
 980.69  841.97  678.78
 358.67  259.18   54.47
 727.61  853.02  273.19
 765.80  923.27  735.39
 842.01  789.38  412.87
   6.27  150.28  604.41
 202.07   85.99  360.41
 989.42  381.59  259.61
 736.17  985.67  953.62
 600.18  430.25  191.29
  78.76  928.20  831.03
 976.54  866.62  524.76
 219.60   67.14  734.89
 875.38  744.15  452.46
 522.64  326.01  507.17
  19.59  453.61  893.02
  32.16  465.05   13.59
 664.38  556.04  154.63
 320.00  544.73    7.41
 211.17  515.82  936.27
  66.11
```

Fig. 2. Example of output from Listing 1.

Program Structure

The structure of the program is to convert the floating point number to an integer by the statement X=INT(A*FACTOR), where A holds the number to be printed and FACTOR equals the value of (INT(10↑DP)+$). This results in truncation at the specified decimal position and is the fastest adjustment possible using pure basic statements.

Next, the program uses CLOG(X) to determine the number of decimal decades. On printing, the decimal point is restored by the statement PRINT X/FACTOR;. The semicolon is used to suppress the new-line (end-of-line) character and leave the cursor positioned to print trailing 0s to the right margin of the print field if necessary. Gosub 29095 is then called to pack P$ with the required number of 0s; P$ is then printed and the process is repeated for each column.

If you need to round to a given decimal place rather than truncate, the program can be modified by including the lines in Listing 2. String P$ is loaded with an adjusted number by STR$(INT(A*FACTOR*10)).

Using string manipulation, only the last two digits are extracted and used as a pointer to a position in string Q$. By adding the value returned by ASC(Q$(PNT)), either a 1 or a 0 is added to the number that was adjusted, truncated and stored as the value of X. The elements of string Q$ are selected to implement a scientific rounding algorithm by which a value of five is rounded to the even value of the next higher decade. For example, 0.024 would be rounded to 0.02 and 0.035 would be rounded to 0.04.

Well, there it is—a useful program that will satisfy a large percentage of your formatting needs. Of course, it will not handle very high or very low numbers.

One other thing to remember: this program, as with any Basic program on the Atari, will run *slowly*. A simple loop to print 100 random numbers in the form of XXX.XXXXX requires 57 seconds using truncation. The same 100 numbers printed without formatting and padding can be printed in 11 seconds.■

```
10 DIM P$(9),OV$(12),UV$(12),Q$(100)
35 Q$(1)=CHR$(0):Q$(100)=CHR$(0):Q$(2)=Q$
40 FOR I=6 TO 96 STEP10:FOR J=0 TO 4
50 IF I+J=6 OR I+J=26 OR I+J=46 OR I+J=66 OR I+J=86 THEN GOTO 70
60 Q$(I+J,I+J)=CHR$(1)
70 NEXTJ:NEXTI
80 FMT=29000:PTC=29095:TRNC=29300:TRO=29700:SRO=29600
130 GOSUB SRO:GOSUB FMT
29050 IF ABS(A)<1 THEN POKE85,PEEK(85)+1+(INT(CLOG(ABS(A))))+1*(SIZE-(IN
T(CLOG(A)))<>DP)*(SIZE<>DP)
29600 REM *** SRO = SHORT ROUNDING ***
29610 GOSUB 29400:P$=STR$(INT(A*FACTOR*10))
29615 X=VAL(P$):IF X=0 THEN RETURN
29620 PNT=VAL(P$(LEN(P$)-1))
29630 X=INT(A*FACTOR)+ASC(Q$(PNT+1)):RETURN
29700 REM *** TRO = TRUE ROUNDING SUBRUTIEN ***
29710 GOSUB 29400
29720 X=INT(A*FACTOR):EVEN=X-(10*(INT(A*(FACTOR/10))))
29730 IF ((CLOG(A*FACTOR-X)=CLOG(0.5) AND EVEN/2<>INT(EVEN/2)) OR CLOG(A*FA
CTOR-X)>CLOG(0.5)) THEN X=X+1
29740 RETURN
```

Listing 2. Program for rounding to a given decimal rather than truncating.

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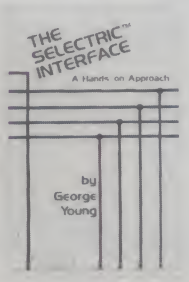

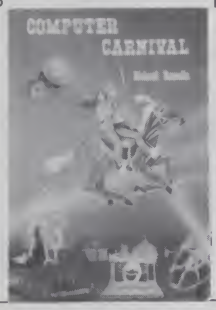

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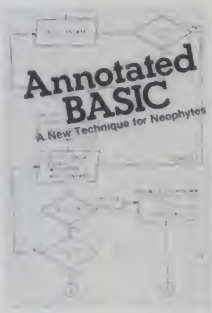

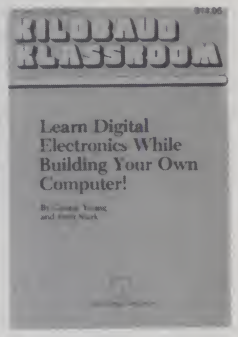

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Z80A-S10/9	40	Serial I/O	16 95
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COP47DN	20	32-seg VAC Fluor Orvr (20-pin pkg.)	3.25
MM5369EST	8	Prog. Oscillator/Divider (100Hz)	1.19

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MM5257	16	4096x1	(450ns) 4044	4.95
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HM6116-4	24	2048x8	(200ns) CMOS	6 95
HM6116LP-4	24	2048x8	(200ns) L P CMOS	7 95
7489	16	16x4	(50ns)	2.25
74C921	18	256x4	(250ns) CMOS	3 95
74C929	16	1024x1	(250ns) CMOS (6501)	3 95
74C930	16	1024x1	(250ns) CMOS (6518)	3 95
74S189	16	16x4	(35ns) 93405	1 95
74S200	16	256x1	(80ns) 93410	3 95
74S206	16	256x1	(60ns) 93411	3 95
74S289	16	16x4	(35ns) 31D1	2 25
82S10	16	1024x1	(50ns) O C. (93415)	3.95
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1702A	24	256x8	(1us)	4 95
2708	24	1024x8	(450ns)	3 95
2708-5	24	1024x8	(550ns) SM00246	2 95
TMS2518	24	2048x8	(450ns) 2716	6 95
TMS2532	24	4096x8	(450ns) NMC2532	9 95
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MCM68764	24	8192x8	(450ns)	39 95
74S188	16	32x8	PROM O C. (6330-1)	1 49
74S287	16	256x4	PROM T.S (6301-1)	1 95
74S288	16	32x8	PROM T.S (6331-1)	1 95
74S387	16	256x4	PROM O C (6300-1)	1 95
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82S123	16	32x8	PROM T S (27S19)	2 95
82S126	16	256x4	PROM O C (27S20)	3 95
82S129	16	256x4	PROM T S (27S21)	3 95
82S130	16	512x4	PROM O C (27S12)	5 95
82S185	18	2048x4	PROM T.S. (TBP24S81)	9 95
DM87S180N	24	1024x8	PROM O C. (82S180)	9 95
DM87S181N	24	1024x8	PROM T S. (82S181)	9 95
DM87S184N	16	2048x4	PROM O C (82S184)	9 95
DM87S185N	18	2048x4	PROM T S (82S185)	9 95
DM87S190N	24	2048x4	PROM O C (82S190)	19 95
DM87S191N	24	2048x8	PROM T S (82S191)	19 95

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MC1406L7	18	7-bit D/A Converter (OAC0807LCN)	2 49
MC1408L6	18	8-bit D/A Converter (DAC0808LCN)	2 95
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ADC0809	28	8-bit A/D Converter (8-Ch. Multi)	4 49
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DAC1008	20	10-bit O/A Conv Micro Comp (0 20%)	7 95
DAC1020	16	10-bit D/A Conv. (0 D5% Lin)	6 49
DAC1D22	16	10-bit O/A Conv (0 20% Lin)	5 95
DAC1222	18	12-bit D/A Conv (0 2D% Lin)	6 95
AF100-1CN	16	Universal Active Filter 2 5%	5 95
AF121-1CJ	24	Touch Tone Low Band Filter	19 95
AF122-1CJ	24	Touch Tone High Band Filter	19 95
LM334Z		Constant Current Source	1 19
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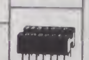

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74HC161	16	1 79
74HC162	16	2 39
74HC163	16	2.39
74HC164	14	1.79
74HC165	16	2.39
74HC173	16	1.59
74HC174	16	1.39
74HC175	16	1 39
74HC192	16	1 39
74HC193	16	1.39
74HC194	16	1 59
74HC195	16	1.49
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74HC4024	14	1.59
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74HC4075	14	75
74HC4078	14	69
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74C32	14	.39
74C42	16	1 39
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74C160	16	1.19
74C161	16	1 19
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74C173	16	.79
74C174	16	1.19
74C175	16	1.19
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74C373	20	2 49
74C374	20	2 49
74C901	14	59
74C903	14	59
74C906	14	.59
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74C912	28	6 95
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LM382N	14	1.39
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LM386N-3	8	89
TL494CN	16	2 95
TL498CP	8	1.19
NE510A	14	4 95
NE529A	14	2 95
NE531V	8	2 95
NE536H		8 95
NE540H		4 95
NE544N	14	2.95
NE550A	14	1 95
NE555V	8	35
LM556N	14	69
LM585N	14	1 19
LM566CN	8	1 49
LM567V	8	89
NE57DN	16	3 95
LM7D3CN	8	1.19

LM709N	14	49
LM710N	14	69
LM711N	14	79
LM723N	14	55
LM733N	14	1.00
LM739N	14	1.95
LM741CN	8	35
LM747N	14	69
LM748N	8	59
LM1310N	14	1 49
LM1458CN	8	.59
LM1488N	14	69
LM1489N	14	69
LM1496N	14	1 95
LM1800N	16	1 49
LM1889N	16	1 95
LM1896N	14	2 95
LM2002T		1 49
LM3189N	16	1 59
LM3900N	14	59
LM3905CN	8	1 19
LM3909N	8	99
LM3914N	18	3 49
LM3915N	18	3.49
LM3916N	18	3.49
RC4136N	**14**	**1.25**
RC4151NB	8	1.95
NE5532	8	2 49
NE5534	8	1.69
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7402	19	7432	17	7485	55	74136	48	74177	75
7403	19	7437	21	7486	35	74141	58	74180	75
7404	19	7438	28	7489	3.25	74145	45	74182	75
7405	24	7440	18	7490	35	74148	1.20	74188	8.50
7408	48	7442	45	7491	40	74152	80	74190	1.10
7408	24	7443	80	7492	45	74153	60	74191	1.10
7409	20	7444	69	7493	30	74154	1.25	74192	70
7410	20	7445	80	7494	65	74155	85	74194	80
7412	21	7447	80	7495	45	74180	75	74195	80
7413	21	7448	80	74107	30	74181	85	74197	70
7414	45	7450	18	74109	45	74184	85	74221	1.25
7418	25	7451	18	74110	45	74185	85	74279	75
7420	18	7454	18	74121	28	74188	1.00	74293	75
7425	29	7472	23	74122	43	74173	75	74298	80
7426	29	7474	31	74123	43	74174	89	74387	80
7427	29	7475	43	74125	35	74175	75	74388	85
7429	45	7478	33					74393	1.35
		7480	55						

74LS

74LS00	24	74LS55	25	74LS139	50	74LS194	85	74LS299	1.95
74LS02	24	74LS73	38	74LS145	1.20	74LS195	85	74LS323	4.75
74LS03	28	74LS74	45	74LS147	2.10	74LS196	75	74LS352	1.25
74LS04	32	74LS75	38	74LS148	1.35	74LS197	75	74LS353	1.25
74LS05	28	74LS78	38	74LS151	55	74LS221	95	74LS365	45
74LS08	28	74LS76	45	74LS153	50	74LS240	95	74LS368	45
74LS09	28	74LS83	55	74LS154	1.90	74LS241	95	74LS367	75
74LS10	26	74LS85	80	74LS155	75	74LS242	95	74LS368	55
74LS11	35	74LS86	35	74LS158	75	74LS243	1.25	74LS373	1.10
74LS12	35	74LS90	50	74LS157	85	74LS244	95	74LS374	1.10
74LS13	45	74LS91	85	74LS158	85	74LS245	1.85	74LS375	85
74LS14	55	74LS92	50	74LS160	89	74LS247	1.10	74LS377	1.25
74LS15	35	74LS93	50	74LS161	85	74LS248	1.10	74LS378	1.15
74LS20	24	74LS95	70	74LS162	89	74LS249	1.10	74LS379	1.25
74LS21	25	74LS98	89	74LS163	85	74LS251	55	74LS388	45
74LS22	24	74LS107	38	74LS164	85	74LS253	55	74LS390	1.20
74LS28	28	74LS109	38	74LS165	85	74LS257	50	74LS393	1.20
74LS27	28	74LS112	38	74LS166	1.75	74LS258	55	74LS395	1.20
74LS28	35	74LS113	38	74LS168	1.55	74LS259	1.75	74LS399	1.40
74LS30	24	74LS114	38	74LS169	1.55	74LS280	55	74LS490	1.90
74LS32	27	74LS122	45	74LS170	1.35	74LS288	55	74LS823	1.90
74LS33	50	74LS123	85	74LS173	85	74LS273	1.45	74LS888	1.85
74LS37	35	74LS125	45	74LS174	85	74LS279	45	74LS889	1.80
74LS38	32	74LS126	48	74LS175	85	74LS280	1.85	74LS870	1.45
74LS42	55	74LS132	58	74LS181	1.95	74LS283	95	74LS883	2.95
74LS46	75	74LS133	55	74LS190	89	74LS290	95	74LS685	2.95
74LS49	75	74LS136	38	74LS191	89	74LS293	85	74LS687	3.50
74LS51	24	74LS137	85	74LS192	75	74LS295	95	74LS783	15.95
74LS54	25	74LS138	50	73LS193	75	74LS298	85		

74S

74S00	30	74S32	40	74S138	85	74S194	1.35	74S280	1.85
74S02	30	74S37	85	74S140	40	74S195	1.35	74S287	1.85
74S03	30	74S38	85	74S151	95	74S201	8.50	74S288	1.85
74S04	35	74S50	25	74S157	95	74S240	2.25	74S289	8.75
74S05	30	74S51	25	74S158	95	74S241	2.25	74S299	8.75
74S08	30	74S64	40	74S181	1.85	74S244	2.75	74S373	2.45
74S09	35	74S65	40	74S183	3.75	74S251	85	74S374	2.45
74S10	35	74S74	50	74S174	95	74S253	85	74S387	1.90
74S11	35	74S85	1.75	74S175	95	74S257	85	74S454	4.50
74S15	35	74S86	50	74S182	2.50	74S258	85	74S470	8.50
74S20	35	74S112	50	74S188	1.85	74S280	75	74S471	9.50
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LM308AN	2.25
LM309K	1.25
LM310	1.45
LM311N	50
LM311H	85
LM317K	3.85
LM318H	1.45
LM322	1.55
LM323K	4.95
LM324	45
LM339	.99
LM348	1.25
LM358	85
LM380	1.10
LM381	1.85
LM388	1.40
LM351	1.95
LM555	.32
LM558	1.10
LM558	2.45
LM585	1.25
LM588	1.45
LM703	.75
LM709	.40
LM710	.75
LM711	.49
LM720	.75
LM723	.75
LM733	.95
LM741-8	.45
LM741N-14	.45
LM741H	.45
LM747	.85
LM775	.25
1330	1.80
1349	1.75
1350	1.15
1358	1.35
1372	4.95
1458	.55
1488	.85
1489	.85
1498	.85
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32K S-100 EPROM CARD
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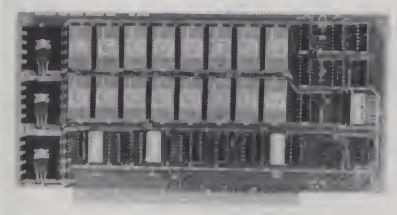

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USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully buffered and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$229.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $199

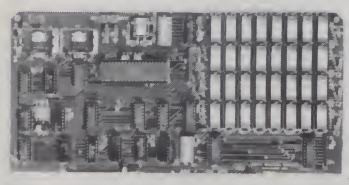
ASSEMBLED AND TESTED ADD $50

FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

256K S-100 SOLID STATE DISK SIMULATOR!

WE CALL THIS BOARD THE "LIGHT-SPEED-100" BECAUSE IT OFFERS AN ASTOUNDING INCREASE IN YOUR COMPUTER'S PERFORMANCE WHEN COMPARED TO A MECHANICAL FLOPPY DISK DRIVE.



FEATURES:

- 256K on board, using + 5V 64K DRAMS.
- Uses new Intel 8203-1 LSI Memory Controller.
- Requires only 4 Dip Switch Selectable I/O Ports.
- Runs on 8080 or Z80 S100 machines.
- Up to 8 LS-100 boards can be run together for 2 Meg. of On Line Solid State Disk Storage.
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- Compare our price! You could pay up to 3 times as much for similar boards.

BLANK PCB (WITH CP/M* 2.2 PATCHES ON DISK) $69.95

$399.00

#LS-100 (FULL 256K KIT)

64K SS-50 STATIC RAM

$179.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50

FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

THE NEW ZRT-80
CRT TERMINAL BOARD!

A LOW COST Z-80 BASED SINGLE BOARD THAT ONLY NEEDS AN ASCII KEYBOARD, POWER SUPPLY, AND VIDEO MONITOR TO MAKE A COMPLETE CRT TERMINAL. USE AS A COMPUTER CONSOLE, OR WITH A MODEM FOR USE WITH ANY OF THE PHONE-LINE COMPUTER SERVICES.

FEATURES:

- Uses a Z80A and 6845 CRT Controller for powerful video capabilities.
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- Higher density formats require up to 3 additional 2K x 8 6116 RAMS.
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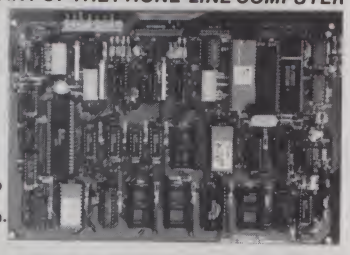

BLANK PCB WITH 2716 CHAR. ROM, 2732 MON. ROM $59.95

SOURCE DISKETTE - ADD $10

SET OF 2 CRYSTALS - ADD $7.50

ZRT-80

WITH 8 IN. SOURCE DISK! **$129.95** (COMPLETE KIT, 2K VIDEO RAM)

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! **NEW!**

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SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- Fully Supports IEEE 696 Buss Standard (As Proposed)
- Supports 24 Bit Extended Adressing
- 200 NS (FAST!) RAM'S are standard on the RAM Kit
- Supports both Cromemco and North Star Bank Select
- Supports Phantom
- On Board wait State Generator
- Every 2K Block may be disabled
- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $129.95

For RAM Kit A&T - Add $40

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SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

(DO NOT CONFUSE WITH ANY OF OUR FLATTERING IMITATORS!)

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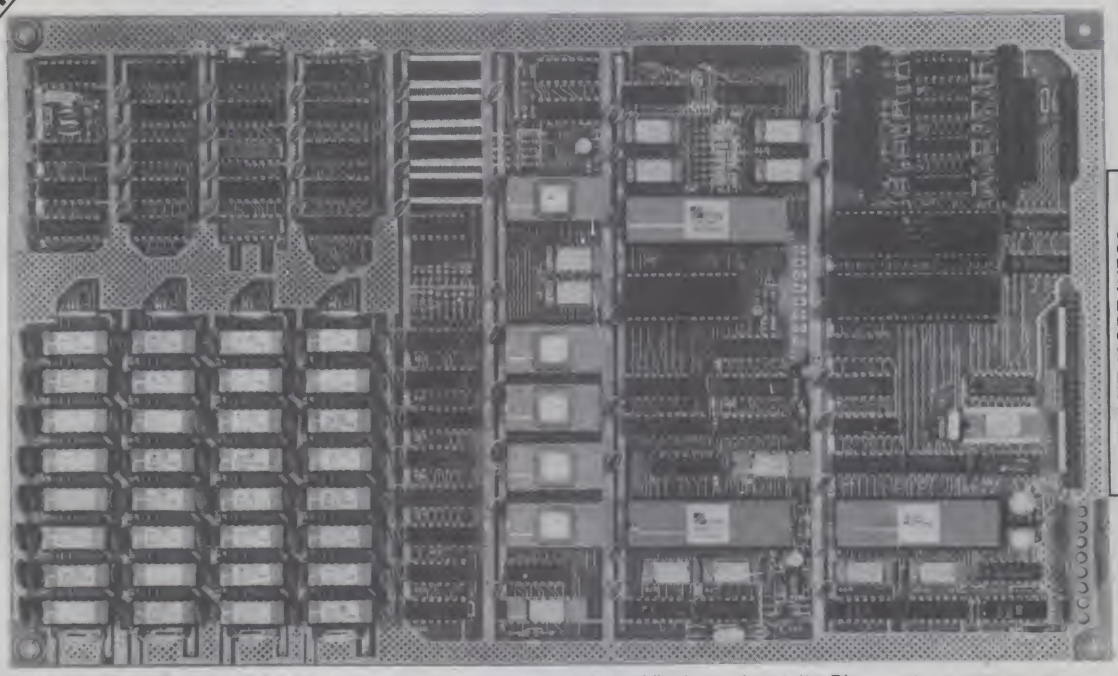
PARTIALLY ASSEMBLED KITS For All Sockets Installed And Soldered Add $50. (Not For Blank PCB)



WANT MORE INFO? Full Documentation and Schematics — $5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

$279.00 ** (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 int. Price for all parts and connectors: $39.95

BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $99.95

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. Uses selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $19.95

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Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $9.95

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. to run on Big Board is available for $139.00.

DOUBLE DENSITY ADAPTER BOARD — $149.95 (A&T)

Requires no cuts or MODS to an existing Big Board. Gives up to 670K storage on a single sided 8 in. diskette. With software to patch your CP/M* 2.2.

PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents capsulized software reviews from various computer-related publications.

Info-SORT

System Requirements: IBM PC; PC-DOS; advanced Basic; 64K RAM minimum
Manufacturer: Info-Pros, Inc., 2102 Business Center Drive, Suite 132, Irvine, CA 92715
Price: $145
Comments: "Info-SORT," says the review, "is a disk-based machine-language, sort/select utility.... It takes a file of fixed-length records from a disk and writes a sorted version of the same file on a disk."

The documentation is good, according to the review, but the package is "limited by design to installations where users are computer literate....For hackers and offices with in-house programming expertise, it could become a valuable tool." Reader Service number 404

(Reviewed in InfoWorld, *April 25, 1983)*

The Tool

System Requirements: Apple II, II Plus or IIe; 48K RAM; Applesoft in ROM or Apple Language Card; one disk drive
Manufacturer: High Technology Software Products, Inc., PO Box 60406, Oklahoma City, OK 73146
Price: $395
Comments: "The Tool," says the review, "...claims to simplify the development of Basic language application software for the Apple II computer, while still providing optimized machine language routines to perform many of the application programs' central tasks."

According to the review, the manual is sketchy and might cause problems even for experienced programmers. The review concludes that "In terms of performance, The Tool is generally good, although somewhat uneven." Reader Service number 409

(Reviewed in InfoWorld, *April 18, 1983)*

Hi-Res Architectural Design

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Avant-Garde Creation, Box 30160, Eugene, OR 97403
Price: $29.95
Comments: This is, says the review, "a program for drawing fairly detailed architectural plans. The commands are simple and drawing a basic plan is relatively easy."

The program provides many different house-plan shapes on a menu and enables you to make various dimensional calculations as you design. While the program can't be used for final building plans, the review concludes that "As an easy-to-use program for sketching and trying out ideas, Hi-Res Architectural Design's handy architectural style is ideal." Reader Service number 411

(Reviewed in Softalk, *May 1983)*

Flight Simulation

System Requirements: Sinclair ZX-81 or Timex/Sinclair 1000; 16K RAM
Manufacturer: Sinclair Research, Ltd., 3 Sinclair Plaza, Nashua, NH 03061
Price: $9.95 (cassette)
Comments: Although Flight Simulation differs from a real flight simulator in several ways, it is not a game, according to the review. What it does best, says the review, "is simulate the navigation and flying of a twin-engine propeller airplane." The simulated flying, including the difficulties of landing, is accomplished with accuracy and detail.

This program will not teach you to fly, concludes the review, but "if you cannot master the principles of the program, you will probably never make a good pilot....despite a few minor drawbacks, it realistically simulates flying a light aircraft." Reader Service number 419

(Reviewed in Popular Computing, *July 1983)*

Assertiveness Training

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Psychological Psoftware, 4757 Sun Valley Road, Del Mar, CA 92014
Price: $29.95
Comments: This program, says the review, "will not really train you to be more assertive. It's really just a tool to help you be a bit more aware of yourself and think about how you might react when presented with different situations that could elicit aggressive behavior."

"As a stimulus," concludes the review, "for starting to think about one's assertiveness, passivity or aggressiveness, this program fills the bill. The first step in making any changes to [sic] oneself is awareness. Consider this program as the possible beginning of a longer journey." Reader Service number 410

(Reviewed in Softalk, *May 1983)*

Pro Poker

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335
Price: $39.95
Comments: "Pro Poker is just that: professional," says the review. "It's by far the best poker program for the Apple." Pro Poker is a teaching tool as well as a game, and, concludes the review, it "is loaded with little touches that make it a dream to use...an excellent program that no budding cardsharp should be without." Reader Service number 412

(Reviewed in Softalk, *May 1983)*

Graphic Generator

System Requirements: Atari 400 or 800; 32K RAM (48K recommended); Atari 810 disk drive
Manufacturer: Datasoft, 19519 Business Center Drive, Northridge, CA 91324
Price: $24.95
Comments: By redefining the Atari's keyboard characters, says the review, the Graphic Generator "can help you create character sets for applications such as scientific notation, mathematical representation or esoteric foreign language alphabets."

The manual assumes a lot of knowledge, but, concludes the review, "If you are an experienced Atari programmer looking for a character-redefinition utility that offers almost every conceivable option, then Graphic Generator can become an invaluable tool." Reader Service number 413

(Reviewed in InfoWorld, *April 11, 1983)*

Dynacalc

System Requirements: 6809-based computer with OS-9, FLEX or UniFLEX operating system; 64K
Manufacturer: SE Media, PO Box 794, Hixson, TN 37343
Price: OS-9 version, $250; FLEX, $200; UniFLEX, $395
Comments: Dynacalc, according to the review, is a large assembly language spreadsheet program for 6809-based computers. It is enough like most other such programs so that a user familiar with any one of them will be able to adjust to Dynacalc easily. Also, practically any terminal is supported.

"Dynacalc is an excellent spreadsheet program," states the review. "It can help with any number of business problems, simple problems in the sciences, and just plain showing off the computer to the uninitiated." Reader Service number 420

(Reviewed in '68' Micro Journal, *June 1983)*

Graph'n' Calc

System Requirements: IBM PC; 64K RAM; DOS 1.1 or 2.0 with either display adapter; one disk drive
Manufacturer: Desk Top Computer Software, Suite 29-303, 303 Portrero St., Santa Cruz, CA 95060
Price: $199
Comments: According to the review, this graph and spreadsheet program is a powerful business-forecasting tool, with the emphasis on the graphing aspect. The author, says the review, has "overlaid the basic graphing and spreadsheet functions with sophisticated statistical modules that would take man-days for a user to build into VisiCalc or 1-2-3."

Although the program is slow (the PC and Basic are both slow), the review concludes that Graph'n' Calc "is a useful and friendly adjunct to any business or department and should find its niche." Reader Service number 405

(Reviewed in Softalk for the IBM Personal Computer, *May 1983)*

Janus/Ada Version 3

System Requirements: CP/M-based computer; minimum of 56K RAM; two floppy disk drives
Manufacturer: RR Software, PO Box 1512, Madison, WI 53701
***Price:** $300*
Comments: Ada is a structured, modular programming language developed by the Department of Defense. Janus/Ada is, says the review, "a nonstandard subset of the Department of Defense Ada specification. The resulting package is powerful enough to be considered a serious language for serious applications."

Although the writing and layout of the manual are clumsy, according to the review, the program is easy to use and much improved over Version 2. The review concludes that "Basically, I feel that the Janus/Ada package from RR Software is excellent." Reader Service number 406

(Reviewed in InfoWorld, *May 2, 1983)*

Remote Access

System Requirements: IBM PC; 64K; one disk drive; asynchronous communications adapter; modem
Manufacturer: Custom Software, PO Box 1005, Bedford, TX 76021
Price: $89
Comments: According to the review, this program enables you to connect your PC or terminal to a remote PC. "Once connected," says the review, "this unique program lets you operate a distant PC as if you were actually sitting in front of it."

Remote Access does all the things other communications programs do, but in addition, states the review, it "gets into the distant computer's DOS, letting you run programs from your location." The only condition for doing this is that the program must be in the remote PC's disk drive.

"For the price and for all it offers," the review concludes, "Remote Access is a tough act to follow." Reader Service number 418

(Reviewed in PC World, *Vol. 1, #5)*

Delta Drawing

System Requirements: Apple II Plus (versions are available for other systems); DOS 3.3; 48K RAM; one disk drive
Manufacturer: Spinnaker Software, 215 First St., Cambridge, MA 02142
Price: $59.95
Comments: Delta Drawing is a graphics program that is simple and easy to use, according to the review. The authors, says the review, "adapted the turtle graphics part of Logo to develop a program that allows the user to create drawings using only single key commands."

The review states that "As a simple, nonthreatening and self-motivating introduction to computers for young children, older students, or even adults, Delta Drawing can't be beat." Reader Service number 407

(Reviewed in Classroom Computer News, *March/April 1983)*

Disk Data Manager

System Requirements: Commodore VIC-20; a minimum of 8K RAM expansion to handle up to 600 records
Manufacturer: MicroSpec, Ltd., 2905 Ports O'Call Court, Plano, TX 75075
Price: $59.95
Comments: Disk Data Manager, according to the review, enables you "to maintain customer profile information and to search out, sort, and print mailing lists and different categories of information for marketing programs."

The review states that the manual is thorough and well-written, and concludes that "Novices should have no difficulty handling the program. . . .Disk Data Manager is quite a flexible, valuable tool." Reader Service number 415

(Reviewed in COMPUTE!, *June 1983)*

Apple Writer IIe

System Requirements: Apple IIe; one disk drive; printer
Manufacturer: Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014
Price: $195
Comments: "Apple Writer for the IIe," says the review, "is the first word processor available that takes advantage of the new machine's abilities." The program is an adaptation of the original Apple Writer, which has been around a long time.

According to the review, the documentation is excellent and the program bug-free. The review concludes that "If you are going to buy an Apple for demanding word processing tasks, you definitely should consider Apple Writer." Reader Service number 417

(Reviewed in Softside,*#42)*

MCDISPLAY Version 1.0

System Requirements: 8080-, 8085- or Z80-based computer; CP/M 1.4 or 2.2 with Microsoft Basic-80; 6.5K RAM plus 32K for MBasic; one eight-inch, single-density, floppy disk drive; cursor-addressable CRT terminal
Manufacturer: Master Computing, Inc., PO Box 17442, Greenville, SC 29606
Price: $175
Comments: The review states that "MCDISPLAY is a software-development utility program for CP/M-80 that allows you to define complete displays in advance when you are developing applications."

The documentation, according to the review, leaves a lot to be desired, but the program "is a potentially outstanding... package that offers an extremely powerful large-computer-application development tool to microcomputer users at a reasonable price." Reader Service number 408

(Reviewed in InfoWorld, *April 18, 1983)*

AtariWriter

System Requirements: Atari computer; 16K RAM
Manufacturer: Atari, Inc., 1265 Borregas Ave., Sunnyvale, CA 94086
Price: $79.95
Comments: AtariWriter is a word processor that, says the review, "can be used with either a cassette or disk system at a price that is hard to beat. The program is very easy to use and comes with an excellent instruction book."

The program will support all Atari printers, and, according to the review, it "is the best non-game program Atari has released...for most people, the AtariWriter should satisfy their needs very well at a very attractive price." Reader Service number 414

(Reviewed in ANTIC, *May 1983)*

Memorite III

System Requirements: Vector Graphic computer; CP/M; 64K RAM; one disk drive; printer
Manufacturer: Vector Graphic, Inc., 500 North Ventu Park Road, Thousand Oaks, CA 91320
Price: $495
Comments: Memorite III is a word-processing program for the Vector Graphic. According to the review, it has good support programs such as a mailing-list program, a spelling module and a merge-phase library, as well as the usual word-processing features.

The review says that the manual is not very well done, but concludes that "this is one of the easiest word-processing packages to learn that I have seen. Vector has not sacrificed power for ease of use, and it has considered both novices and experienced users in its design." Reader Service number 402

(Reviewed in InfoWorld, *May 9, 1983)*

Multiple Device Spooler 03.16.82(a)

System Requirements: Heath/Zenith H-89, Z-89, Z-90 or H-8; HDOS 2.0; 24K RAM; at least one disk drive; printer
Manufacturer: Software Wizardry, Inc., 122 Yankee Drive, St. Charles, MO 63301
Price: $24.95
Comments: "Multiple Device Spooler," states the review, "consists of seven device drives that enable you to print output to other devices while you are using your computer for other operations."

The program has fairly good documentation and, concludes the review, "is extremely easy to use and works well. It is reasonably priced and could save you the price of a faster printer." Reader Service number 401

(Reviewed in InfoWorld, *May 23, 1983)*

EasyFiler

System Requirements: IBM PC; PC-DOS; 64K RAM; two disk drives (160K or 320K)
Manufacturer: Information Unlimited Software, Inc., 2401 Marinship Way, Sausalito, CA 94965
Price: $400
Comments: EasyFiler is a comprehensive database management system, which, according to the review, has some powerful features. "If you've decided," says the review, "that you truly need some help in managing your complex data,...the power of EasyFiler may be worth the time and money spent."

The program performs well and comes with clear and informative documentation. "If you have a small business," concludes the review, "and deal with volumes of complex data for which you must draw up numerous reports, EasyFiler should be a nice investment." Reader Service number 403
ber 403

(Reviewed in InfoWorld, *May 2, 1983)*

Copy-Writer

System Requirements: PET/CBM with 2040, 4040, 8050 or PEDISK II drives; Apple II with 3.2 or 3.3 disks; Apple III; Commodore-64 with 1541 or PEDISK III drives; the program supports all ROM variations and virtually any printer.
Manufacturer: CGRS Microtech, PO Box 102, Langhorne, PA 19047
Price: $145
Comments: According to the review, Copy-Writer is an easy-to-use word processor, consisting of one diskette and a small but thorough manual. "Copy-Writer is extremely powerful for formatting the printed page," says the review.

"The diskette cannot be copied," continues the review, "but that is not a problem—you use it to create a machine language program configured especially for your own ROMs, screen size, keyboard and printer, and *that* program can be saved and copied without limit....It seems to be a solid program with good features and few bugs." Reader Service number 416

(Reviewed in COMPUTE!, *July 1983)*

ANTIC, 297 Missouri St., San Francisco, CA 94107.

Classroom Computer News, 341 Mt. Auburn St., Watertown, MA 02172.

COMPUTE! published by Small System Services, Inc., PO Box 5406, Greensboro, NC 27403.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701.

PC World, 555 DeHaro St., San Francisco, CA 94107.

Popular Computing, published by BYTE publications, Inc., 70 Main St., Peterborough, NH 03458.

'68' Micro Journal, PO Box 849, Hixson, TN 37343.

Softalk and *Softalk for the IBM Personal Computer*, 11160 McCormick St., North Hollywood, CA 91601.

Softside, 6 South St., Milford, NH 03055.

Table. Addresses of the magazines publishing the software reviews digested in this department.

DEALER DIRECTORY

Woodbridge, CT

RIP-SOFT! New game spoofs computer bizz. Break the 'calc habit—IBM PC software—See how—Open Basic—Program catalog—Programmer's toolbox—Utilities and fun. **People Systems, Ltd., 78 Maplevale Drive, Woodbridge, CT 06525; 393-3913.**

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-0421.**

Aurora, IL

DYSAN Diskettes, Authorized Dealer. We also supply many name brand computers, terminals, printers, software & accessories. All at discount. Call for pricing. **Fox Valley Computer Systems, Sales Order Dept., 1745 Jericho Road, Aurora, IL 60506; 859-0304.**

Aurora, IL

Full line of Apple Computer and Fortune Computer, Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. **Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).**

Dealers: Listings are $15 per month in prepaid quarterly payments, or one yearly payment of $150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

FOR SALE: 4 unused Shugart 8-inch SA1002, 5.33 megabyte hard disk drives for $380 each. Also have Western Digital's controller for this drive, $350 each. Herb Merrill, 20 Randy Drive, Taylors, SC 29687; 803-877-9444.

Software on tape. ZX81: 50 games, 4K; 100 games, 1K; 20 games, 16K. SPECTRUM: 50 games, 16K. Each tape only $6; by air, $9. Bruno Del Medico, Torino 72, 04016 Sabaudia, Italy.

What are you doing with your computer? Penpals wanted. Exchange ideas and software. Robert Ashworth, PO Box 2161, Bellingham, WA 98227.

Classified Ads Get Results!

CLUB NOTES

TRS-80 Group—Portland, Maine

The Southern Maine TRS-80 Users Group has recently changed its address to 82 Wellington Road, Portland, ME 04103. For further information about the Group, write Anthony Scarpelli at the above address.

COMMON—IBM Group

COMMON is an IBM computer user's group with a worldwide membership of over 2000 operating a variety of IBM systems. COMMON sponsors an annual conference (see this month's Calendar section).

For further information, contact David G. Lister, Administrative Director, COMMON, 435 North Michigan Ave., Suite 1717, Chicago, IL 60611; 312-644-0828.

Color Club

A color computer club has been formed in Tri-Cities in south-central Washington. The club meets on the first and third Saturdays of each month. If interested, contact Thell Rooney, 1301 W. John Day Ave., Kennewick, WA 99336; 509-586-4840.

Pascal Society—California

The UCSD Pascal System User's Society (USUS) has formed a special interest group for users of the new Modula-2 programming language. For information about this new group or about USUS activities, write the Secretary, USUS, PO Box 1148, La Jolla, CA 92038.

Robotics Society Of America

The Robotics Society of America (RSA), a non-profit organization, has been formed with the goal of facilitating information exchange, promoting hobbyist experimentation with robots and providing a forum for public discussion of the proper role of robots in society.

RSA's journal is seeking contributions and the Society is soliciting memberships—$25 for regular membership; $15 for students. For further information, write or call Dr. Walter Tunick at the Society's address: 200 California Ave., Suite 215, Palo Alto, CA 94306; 415-326-6095.

Apple Siders of Cincinnati

Apple Siders of Cincinnati is an Apple users Club of some 450 members, which sponsors a yearly convention (see this month's Calendar section).

For information concerning the Club and its events and activities, contact the Convention advertising manager, Bill Fowee, 1074 Brooke Ave., Cincinnati, OH 45230; 513-659-4309.

CALENDAR

CP/M '83/East—Boston

CP/M '83/East, the International Conference and Exposition of CP/M microcomputer software, will be held September 29–October 1 at Hynes Auditorium in Boston, MA.

For further information, call 800-343-2222 or 617-739-2000.

Computer Showcase—San Francisco

The third annual San Francisco Computer Showcase Expo will take place September 29–October 2 at Brooks Hall. The Expo is primarily designed for business, professional and corporate users of small computers and word processing systems.

Tutorial Seminars will be offered for additional fees. For further information, call The Interface Group, 617-449-6600 or, from outside Massachusetts, 800-325-3330.

Education Conference on the Hudson

The Microcomputer Educator Group's third annual conference on microcomputers in education will be held October 1 at Dutchess County Community College, Pendell Road, Poughkeepsie, NY 12601. For more information, call Dr. Florence Staats at 914-471-4500, extension 240.

PC '83—Boston

PC '83, an international conference and exposition featuring IBM Personal Computers and PC-compatibles. will be held October 4–6 at the Bayside Exposition Center in Boston.

Seminar programs and general sessions will deal with applications and technical information and will show users how to get the most from their PCs. For further information, write or call Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 800-841-7000 or, in Massachusetts, 617-739-2000.

Great Southern Show—Florida

The Orlando Expo Center will be the site on October 7–9 for the Great Southern Computer and Electronics Show, featuring computer and electronics exhibitors operating in the southern United States markets.

Various classes, workshops, seminars and panel discussions will also be scheduled. For registration information, call 904-384-6440.

Tidewater Convention—Virginia Beach

The Tidewater 8th annual Computer Convention-Hamfest-Electronic Flea Market is scheduled for October 8–9 at the Virginia Beach Pavillion. The event will feature dealers, displays and forums. For information and tickets, write Jim Harrison, 1234 Little Bay, Norfolk, VA 23503, or call 804-587-1695.

ONLINE '83—Chicago

ONLINE '83, the fifth annual conference and exposition for online database users, will take place October 10–12 at the Palmer House in Chicago. The focus of the conference will be on microcomputing software, particularly with reference to database and other information applications.

For program, application or other information, call Jean-Paul Emard, the conference chairman, at 203-227-8466.

New York Coliseum Show

The Information Management Exposition and Conference: INFO 83 will be held in the New York Coliseum October 10–13. More than 300 companies will exhibit products.

The Software Center proved to be the hit of the show in 1982 and will be 60 percent larger this year. For further information, write INFO 83, 708 Third Ave., New York, NY 10017 or call 212-661-8410.

EduTech/East—Philadelphia

EduTech/East '83, the national educational computer conference and exposition, will be held October 13–15 at the Philadelphia Civic Center. The conference will offer over 300 hours of sessions.

Presentations will include computer use in instruction, administration, research and many other areas. For further information, contact Carol Houts, Judco Computer Expos, Inc., 2629 North Scottsdale Road, Suite 201, Scottsdale, AZ 85257; 800-528-2355 or, within Arizona, 602-990-1715.

Apple Convention—Cincinnati

The Apple Siders Computer Club of Cincinnati is sponsoring its fifth Convention October 15 at Cincinnati Technical College, Cincinnati, OH. There will be presentations, demonstrations, lectures and displays. For more details, call Bill Fowee, 513-659-4309.

SYSTEMS 83 in Munich

SYSTEMS, the only European exhibition devoted exclusively to computers and end-user applications, is scheduled for October 17–21 at the Munich, West Germany, Fair Center. Complete details can be obtained from Kallman Associates, 5 Maple Court, Ridgewood, NJ 07450 or call 201-652-7070.

Education Conference—Silicon Valley

The IEEE Computer Society is sponsoring EdCompCom '83, a conference on educational uses of computer technology, to be held October 18–20 in Silicon Valley, with Conference headquarters in the Red Lion Inn, San Jose, CA.

The Conference will focus on potential and actual uses of the latest developments in computer-related hardware and software, including such innovations as touch screens and robotics. For further information, contact M. Dundee Maples, conference co-chairman, Educational Computer, PO Box 535, Cupertino, CA 95015; 408-252-3224.

ICC—Pennsylvania and Virginia

The Invitational Computer Conference will be held at two locations: October 18 at the Valley Forge Hilton Hotel, King of Prussia, PA and October 20 at Tyson's Corner Marriott Hotel, Vienna, VA.

The ICCs are one-day, by-invitation-only conferences directed to a select audience of volume buyers and featuring technical seminars as well as displays of operating equipment. For more information, write or call Susan Fitzgerald, B.J. Johnson & Associates, 3151 Airway Ave., #C-2, Costa Mesa, CA 92626; 714-957-0171.

Software Show—San Francisco

The National Software Show will take place October 19–21 at the Trade Show Center in San Francisco. The show is primarily for manufacturers to present their software packages to sales organization representatives.

Seminars and conference sessions will complement the many exhibits. For more information, call David Russell, president, Raging Bear Productions, at 800-732-2300 or, from within California, 415-924-1194.

Chicago Show

The Chicagoland Personal Computer Show will take place October 21–23 at O'Hare Expo Center. Its main aim is to inform the new personal computer buyer and to show him what is available. For additional information, write Chicagoland Personal Computer Show, Suite 400, 222 West Adams St., Chicago, IL 60606, or call Richard Lewis at 312-263-3131.

IBM Conference—Phoenix

COMMON, a large IBM user's group, will hold its fall 1983 conference on October 22–26 at the Phoenix, AZ, Hilton Hotel. The main thrust—covering systems, applications and management—is to keep the data processing professional well informed on new developments.

The more than 170 sessions will feature user and IBM speakers. There will also be presentations by Northwestern University specialists concerning professional development. For more information, contact David G. Lister, administrative director, COMMON, 435 North Michigan Ave., Suite 1717, Chicago IL 60611; 312-644-0828.

Computers in Medical Care—Baltimore

The Seventh Annual Symposium on Computer Applications in Medical Care will take place October 23–26 at the Baltimore Convention Center, Baltimore, MD. The program will include both theoretical and practical treatment of the art and science of applying and using information technology in health care.

Presentation of papers, demonstrations, panel discussions and workshops will constitute the program. All inquiries should be directed to Dr. Ruth E. Dayhoff, SCAMC-Office of CME, 2300 K St. N.W., Washington, DC 20037; 202-676-4285.

ACM Conference—New York

"Extending the Human Resource" is the theme of the 1983 annual conference of the Association for Computing Machinery, to be held at the Sheraton Centre Hotel in New York City, October 24–26. The focus of the conference will be on computing theory and practice, with special emphasis on personal computing.

The Conference will also feature an extensive exhibit and the Fourth International Computer Chess Championships. For further information, call 212-620-5055.

Educational Conference—California

The California Educational Data Processing Association will hold its 1983 conference October 26–28 at the Red Lion Inn, San Jose, CA. The conference will examine the computer power available to professionals and the impact of computers on education.

For information and registration, contact Jane Householder, Room 226, 9300 East Imperial Highway, Downey, CA 90242; 213-922-6141.

Mid-Atlantic Show—Washington

The Mid-Atlantic Computer Show and Office Equipment Exposition will be held October 27–30 at the Washington Convention Center, Washington, DC. For details, contact Computer Expositions, Inc., PO Box 3315, Annapolis, MD 21403; 800-368-2066 or, from within Maryland, 800-492-0192.

Applefest—San Francisco

Applefest—San Francisco will be held October 28–30 at the Moscone Center in San Francisco. It is the largest Apple-specific show in the country. For more details, call Northeast Expositions, 800-841-7000 or, from within Massachusetts, 617-739-2000.

INTECH '83—Chicago

INTECH '83, a conference focusing on integration of office information systems, will take place November 1–3 in Chicago's McCormick Place. For more information, call 800-638-8510 or, 301-459-8383.

New England Computer Show

The New England Computer Show and Sale will take place November 3–6 at the Centrum in Worcester, MA. The show will include displays and demonstrations of the latest business and personal hardware, software and peripherals. For more information, call 617-366-1476.

ISII Conference—Kansas

The International Society for Individualized Instruction will hold its annual conference November 4–6 at Doubletree Inn in Overland Park, KS. The conference is entitled Individualized Instruction in the Eighties: Learning with Computers. For further details, call 913-749-4380.

San Diego Society Fair

The San Diego Computer Society will present its fourth annual fair November 5–6 at the Scottish Rite Center, 1895 Camino del Rio South, in San Diego's Mission Valley.

The fair will feature technical sessions, programming and computer game contests and displays by user groups. For more details, call the Society at 619-565-8720.

Northeast Show—Boston

The fifth annual Northeast Computer Show and Software Exposition will be held November 17–19 in Boston's Hynes Auditorium. The show is the largest annual end-user computer event in the East. For more information, call 800-841-7000 or, from within Massachusetts, 617-739-2000.

Light Reading on Heavy Topics
Running the SuperCalc Gamut
An Ideal Intro to CP/M
An Apple Guide—Not Just for Apple-holics

The Official Silicon Valley Guy Handbook

Patty Bell
Doug Myrland
Avon, 1983
959 8th Ave.
New York, NY 10019
Paperback, 105 pp., $3.95

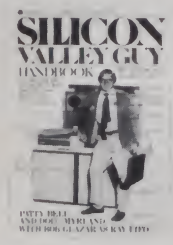
The Official Computer Hater's Handbook

D.J. Arneson
Dell, 1983
1 Dag Hammarskjold Plaza
New York, NY 10017
Paperback, 192 pp., $3.95

Techie humor is funny only in small doses. In the case of *The Official Silicon Valley Guy Handbook*, a caustic mock-out of the hacker, it works. In *The Official Computer Hater's Handbook*, it's stretched too thin to be effective; reading it is like hearing a knock-knock joke dragged over 20 minutes.

The Official Silicon Valley Guy (SVG) *Handbook* is a well-organized, snappy paperback that pokes legitimate fun at those who plunge headlong into the world of computers.

By keeping each of the dozen chapters to two- to four-page essays riddled with one-liners, authors Patty Bell and Doug Myrland deride the techie without being malicious. They've got the teenage "chippie" tapping into Bell Systems' long-distance network, the college chippie reprogramming his university's master computer to shorten each semester to two weeks and to do away with final exams, and the techie graduate pulling his Honda Accord into the parking lot of a multinational computer corporation to start a high-paying job.



The authors have the SVG getting most of his meals from vending machines, and they have him getting exercise by searching for his car in the parking lot after work. In the chapter "Shopping For Software," the jabs continue—the SVG's criteria for buying clothes include these questions: Am I cold? Am I a boy or a girl? Does this store sell clothes?

After telling the tale of the SVG's career, which lasts no longer than 15 years, Bell and Myrland describe "SVG Burnout." "How many years of late nights, vending-machine food and exposure to low-level radiation could *you* handle?" they ask.

The SVG Handbook concludes with a cute glossary of techie terms. An edit statement, for instance, is "Small talk," and floppy disk failure means "All dressed up with no place to go." A cute ending for a cute book . . . and for the few dollars it costs, it'll supply some laughs.

The Official Computer Hater's Handbook has some laughs, too—but they're scattered over almost 200 pages, and most of them are contrived. It's a cluttered, hastily designed release that just goes on too long. In most cases, the story-telling is too juvenile to be funny.

Putting micros in the hands of Adam and Eve, Attila the Hun, Marco Polo and other Biblical and historical figures is clever, but author D.J. Arneson doesn't pull it off. And a lot of the sidebars run dry—especially one entitled "101 Things To Do With A Dead Computer" (Bowl with it? Wallpaper over it? . . .).

In spots, Arneson fires some stinging barbs; in the chapter "Computer Personae," he ridicules (using plenty of hyperbole) the stereotypical hacker. A white shirt with a pencil case in the pocket, white socks, worn-out running shoes and shiny suit pants are clothes the hacker wears, and the foods he's stimulated by include warm coke, twinkies, week-old pizza and lukewarm coffee.

Arneson includes a chapter on "Valley Guys," but it's pretentious and unoriginal. He makes strides to atone, however, in the final chapter—"Hardware, Software and Nowhere." In that chapter, funny sections called "Mother Goose Video Games," "Computer Crime," "Komputer Kamps for Kooks" and "Computer Dating" spice up the book, probably because each of these sections is brief—not overdone.

Arneson ends strongly with a glossary of his own. ASCII, he says, is the "key to your girlfriend's apartment." And a program is a "random accumulation of bugs."

If *The Offical Computer Hater's Handbook* wasn't such a random accumulation—if it were edited in half—it might have worked.

Larry Canale
***Microcomputing* staff**

How To Use SuperCalc

Deborrah Smithy-Willis,
Jerry Willis and Merl Miller
dilithium Press, 1982
PO Box 606
Beaverton, OR 97075
Softcover, 102 pp., $19.95

Doing Business with SuperCalc

Stanley R. Trost
Sybex, 1983
2344 Sixth St.
Berkeley, CA 94710
Softcover, 248 pp., $12.95

Sometimes it's a good idea to buy books the same way you buy shoes or socks—in pairs. But unlike shoes and socks, the books shouldn't match; they

don't even need to be from the same publisher. The idea behind buying by twos is that one book makes up for the weaknesses of the other.

Two new books on SuperCalc are a perfect example of this. *How To Use SuperCalc* is a superb introduction and *Doing Business With SuperCalc* takes you to the next step, from beginner to seasoned user.

Although billed as an introduction to SuperCalc, dilithium Press has produced a book that should be helpful to any would-be or new electronic-spreadsheet user.

Most calc books only give lip service as to the whys of electronic spreadsheets. The authors of *How to Use SuperCalc* realize that their readers may not know *why*, so they take the time to tell you with several specific examples in the first chapter. Overviews on computers and software supplement this chapter.

If you're an experienced computerist, feel free to skip the introductory material and start on chapter 4. From that point on, the book takes a hands-on, interactive approach, with the stress on learning concepts rather than on obtaining immediate results.

The text is supplemented by reproductions of screen images instead of mock-ups to ensure continuity with real-life settings.

How To Use SuperCalc thoroughly covers the basics, but it doesn't discuss every command in detail or provide more than a handful of application templates. It's a bit like learning how to hoist the sails and steer the boat—but there's nothing about how to set a course aimed at your destination.

If you mastered the basics and are looking for guidance on how to get from point A to point B using SuperCalc, consider *Doing Business with SuperCalc*. It presents more than 40 applications, ranging from an invoicing system to an abbreviated income tax solver. As you might have guessed, much of the book is devoted to template listings. But the author also gives a brief introduction to each application and highlights key equations and commands.

The main drawback of *Doing Business with SuperCalc* and similar calc books is the limited usefulness of the applications. Out of 40 templates you may find only a handful that can be directly applied.

As you become more confident of your ability to use SuperCalc, you'll find yourself shunning the prepackaged application and favoring ones that are developed from scratch. But until you reach that point, guidebooks like *Doing Business with SuperCalc* will prove to be invaluable. And if you're willing to do a little detective work, it's possible to use a SuperCalc book with VisiCalc or a VisiCalc book with SuperCalc.

Tim Daniel
Peterborough, NH

Mastering CP/M

Alan R. Miller
Sybex, 1983
2344 Sixth St.
Berkeley, CA 94710
Paperback, 398 pp., $15.95

Mastering CP/M should have a prominent subtitle on the cover: "With Macro Assembly Language Programming." That would help filter out the potential readers who are not into intimate interfacing with operating systems at the assembly language level. If you are not so inclined, go ahead and skip the rest of this review, too.

Assembly language is alive and well (I read that somewhere), and is the language of choice when compact code, speed of execution or the lowest level of interfacing with your computer's hardware or operating system are important.

There are three ways to write assembly language programs. First, you can string instructions together until the job is done. No one recommends that method, but you see it a lot. Second, you can break up your program into logical building blocks and write a subroutine to perform each separate function. The most advanced technique is to replace those subroutines with *macros*, and build up a library of useful functions in the form of macros.

A macro, in case you're not familiar with the term, is like a subroutine in that it performs a logically separate function within a program. A macro can be invoked once, or many times, within a program to perform that single function.

Macros are written and debugged individually and then combined into a library. They are invoked simply by stating their name within a program, just as though that name were an assembly language opcode. The named macro will be fetched from the library by the assembler and merged into your program at the indicated place.

Since your CP/M assembler (ASM-COM) does not support macros, you will need to buy a CP/M-compatible macro assembler (M-80 from Microsoft, or MAC or RMAC from Digital Research) in addition to this book before following the author's instructions on how to master CP/M. Alan Miller discusses the use of both M-80 and MAC and the differences between them. You should have no trouble with the subject matter of this book using either of these assemblers.

Mastering CP/M covers topics ranging from simple console input/output to reading and writing disk files. Along the way the reader is taught the proper way to write macros and to build up a macro library.

Simply creating on your disk the samples in the book will result in a complete library of routines that make use of most

of the features of the CP/M operating system. These library routines are then combined into example programs that illustrate how CP/M works and how you can make use of the functions provided by the operating system.

While the author covers macro-writing and the functions of CP/M in immense detail, the coverage is *not* something a beginning programmer would be able to follow. Reading one of the many introductions to assembly language and CP/M should be a prerequisite to beginning the exercises in this book. Then you should be ready to master CP/M, with Alan Miller's help.

But first: one or two words of caution. If your computer is not identical to the author's North Star, you may trip over a couple of hardware-specific example exercises in this book. His most serious error is in assuming that your computer makes no use of CP/M's IOBYTE; his use of that stored byte in a non-CP/M manner will cause the console to go dead on many microcomputer systems! Another exercise in the book assumes the existence of unused storage at memory addresses F000 to FFFF (in hexadecimal).

The author should have left these incompatible examples out of the book altogether, or he should have replaced them with similar functions that would work on any CP/M-based computer. That's what standard operating systems are for: compatibility.

These glitches aside, *Mastering CP/M* is about the best introduction to macro programming available anywhere; it also includes many examples of interfacing with your computer's operating system, as well as detailed explanations of how that system works. And when you've finished all of the exercises, you'll own an extensive library of program building blocks that are worth many times the price of the book.

Ken Barbier
Borrego Springs, CA

Enhancing Your Apple II, Volume 1

Don Lancaster
Howard W. Sams and Co., 1982
4300 W. 62nd St.
Indianapolis, IN 46268
Paperback, 232 pp., $15.95

Some people can solder and work their way through microcomputers with great skill. Some can code microcomputers in assembly and machine language effectively. Some can even write about such things in crystal-clear language. However, few can do all of these thing well. Don Lancaster can, and he does so with this result: sophisticated ideas become easy to follow.

Lancaster seems to have fallen insanely in love with his Apple II. Read his introduction to *Enhancing Your Apple II, Vol. 1* if you have any doubts. But that's the way it should be for anyone who wants to enhance the Apple hardware and software and tell the world all about "*it*."

> Even though this book looks like a must for Apple-holics, it isn't necessary to be an Apple owner to get your money's worth . . .

From page 7: "The '*it*' revelation is for real. Just ask anyone who has worked with an Apple long enough. . . . The Apple II is far and away the most powerful tool *ever* put into the hands of many individuals on an uncontrolled and unregulated basis. . . . Future historians will recognize the Apple II is the DC-3 of the microcomputer revolution."

Those are strong words, but the jet age did follow the DC-3 era, and not even Lancaster can stop the clock at Apple II.

Even though this book looks like a must for Apple-holics, it isn't necessary to be an Apple owner to get your money's worth out of it. Lancaster is a CRT buff of the first order, and seven out of the eight chapters deal with getting the most out of CRTs—shades of Lancaster's earlier books, *Cheap Video Cookbook* and *Son of Cheap Video*.

Lancaster claims that there are big improvements in CRT performance despite the low costs and despite the small changes involved—eliminating color fringes on hi-res, switching from color to gray patterns and back, controlling the "color killer" circuit, locking onto video timing for split screens and high-accuracy light pens, mixing text and hi-res and lo-res anywhere on the screen, handling glitches (characters caught "in the pipeline" when CRT mode is switched) with a glitch stomper, scrolling the display upward smoothly at reading speed rather than at standard line-jump scroll, and getting color from a palette of 191 solid color backgrounds or 1.8E19 color background patterns.

All of these modifications can be carried out in ways that don't void the warranty (if you take care to do them Lancaster's way). The diagrams and instructions and software are all there, and they're good.

Exploiting Goodies

Lancaster's touch is based on detailed knowledge of what's going on in the electronics and software fields. He forges ahead exploring the microseconds and bits to find goodies that can be exploited (and travesties to be avoided).

Every manufacturer needs to get his product to the market before his competition does, so he freezes, designs and shoves it all into production fast. He also hides his secrets from prying eyes any way he can. That leaves a lot of room for designers to get more out of the chips and code, but the amateur isn't going to get close without some good words to guide him, and professionals usually can't afford the time or equipment. So *Enhancing Your Apple* is cheap compared to what you can get out of it.

Software buffs are likely to vote for the third chapter ("Tearing Into Machine-Language Code") as the jewel of the collection. It is a unique contribution that applies to all machine languages, of which Apple is only one. Possibly no manual anywhere that describes the use of disassemblers and techniques for extracting hidden code can equal this 60-page adventure in decryption. Programmers would do well to look into this chapter to check on techniques they might have missed; commercial software vendors may want to know some things that hackers do to defeat them.

Anyone who wants to install hardware and software modifications in his Apple should have a fairly easy time of it with the help of this book. It has explicit, detailed instructions.

Besides, there are three bingo cards in the back of the book. The bottom one is an order blank for a complete parts kit ($11.95 plus shipping); the second is an order blank for the "26-program DOS 3.3 Companion Diskette" containing all of the software routines ($14.95); the top one is a simple response card to open up a channel of communications with the guru himself (updates, modem communications, express opinions and results).

Enhancing Your Apple II, Vol. 1 appears to be the first among several. The last page is devoted to a preview of enhancements going into Vol. 2: professional-level CRT graphics with splits and wipes, screen dumps for daisy wheel printers, cassette recorder reliability and ease-of-use modes, new goodies in Adventure, six keyboard upgrades (autorepeat, shift, external keypad, key duration, lap keyboard, user-defined keys), auto menu system for non-computer users, fast and exact field sync and an ultrasonic BSR interface for controller applications. Thus far, nothing is said about Language Cards, Microsoft CP/M cards or other specialty cards.

This sort of thing could develop into a cult. It might even create a market for the older models of the Apple II after the Super II arrives, along with Lisa and Macintosh. Or, it could open up a need for people who can make these modifications to create custom systems. This book is aimed at people who are doers and want superior results.

Jim Derry
Akron, OH

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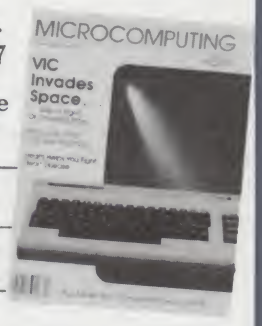

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Writing in Code

CodeWriter, software that allows users of popular desktop computers to design application programs without knowledge of computer programming, now is available for the Commodore-64.

Any C-64 user—even the novice—can write a program with CodeWriter simply by typing the screen layout form and the calculations into the computer in plain English. CodeWriter automatically translates the plain language into computer-language "code."

Applications that can be developed on the C-64 with CodeWriter include payables and receivables, sales analyses, customer and personnel files, mailing lists, invoices, inventory and production charts and order entry.

CodeWriter is self-prompting and rejects improper or illogical input, giving the user a new chance to enter the proper information.

CodeWriter also is available for the Apple II Plus, the Apple IIe, the IBM PC, Commodore 8000 series machines and Victor 9000 series micros. Versions for other machines are being developed.

For more information on CodeWriter, which retails for $399, contact Dynatech MicroSoftware, Inc., 7847 N. Caldwell Ave., Niles, IL 60648. Reader Service number 473.

CodeWriter, which sells for $399, allows the novice computerist to write application programs for the Commodore-64, the IBM PC, and other micros.

Ideal IBM PC Program Generator

DataBurst, a program generator with full-screen access and the ability to manipulate up to 16 different screen formats, is now available for the IBM PC. This design tool for any Basic programmer creates screen formats and generates Basic programs for any user-interactive application.

All screen and keyboard I/O is handled through one assembly language subroutine; this subroutine is external to the user's Basic application program.

In designing a screen, DataBurst's editor allows you to manipulate a picture of a screen. To simplify screen design, the keyboard has been reprogrammed to provide easy access to the special graphics characters. DataBurst then generates a source file containing statements that describe the contents and functions of various locations on the screen.

Additional attributes can be assigned to individual fields. Display attributes include underlining, image reversing and blinking. Other attributes include field type (input, output or constant) and data type (alphabetic or numeric).

DataBurst enables you to enhance the special features of the IBM PC keyboard. The ALT keys can be preprogrammed to represent a string of up to ten characters. Defini-

tions given to the ALT keys at design time assign their run-time value.

After the screen source file is compiled, the screens are displayed to the programmer for visual verification.

DataBurst sells for $225 from Key Solutions, Inc., PO Box 2297, Santa Clara, CA 95055. Reader Service number 466.

Productive Package For IBM Programmers

Key-1 Computer Systems has announced a package of productivity tools for programmers using the IBM PC. The new software, Keytools, includes more than 15 programs designed to speed the production of programs written in Advanced Basic under PC DOS 1.1 and to make the resulting programs faster and more efficient.

Keytools includes Picasso, a multifaceted screenmaker; Emerson, a formatted data entry subroutine; Socrates, a program that builds on-line help facilities in a matter of minutes; and Youngman, a collection of "one-liners" culled from the portfolios of professional programmers.

The programs are provided variously as commented Basic code, high-speed Compiled Basic, mergeable subroutines and structured listings, all for inclusion in the user's own programs.

The programs that make up Keytools are designed to complement each other in making the development of application programs faster. The screens prepared using Picasso become the screen-forms into which data is entered using Emerson. On-line instructions and tutorials created with Socrates use Picasso-generated screens and become interactive through the use of Emerson. Any of the applications are enhanced by the use of the one-liner subroutines from Youngman.

Keytools is supplied on two double-sided disks; it includes a manual and reference card. It requires the IBM PC, PC DOS 1.1 and 64K RAM, and it operates with either monochrome or color display.

The introductory price of Keytools is $40. It's available from Key-1 Computer Systems, 178 Spring St., Newport, RI 02840. Reader Service number 464.

School Daze

Technical-minded teachers might be interested in GradeCalc, a grade and attendance management package designed to ease record-keeping tasks.

In using GradeCalc, you file raw grades and assignment information. The grades are averaged using a variety of methods, ranging from percentage scores to letter grades.

GradeCalc also keeps track of attendance records. The program allows the teacher to keep reports based on attendance totals, including cumulative records of excessive absences or other problems.

GradeCalc is available on disk for the Commodore-64, 40- or 80-column PET/CBM computers, the Apple II Plus, the Apple IIe with at least 32K of memory and the Atari 400, 800 or 1200 with 40K of memory. It sells for $29.95 (Atari versions are $34.95). Contact Tamarack Software, Inc., Water Street, Darby, MT 59829. Reader Service number 465.

Financial Aid

Business Finance Utility is a fully-integrated, menu-driven set of subsystems to cover the financial needs of the small-business owner.

Included in the package are:

- An A/R system with invoicing;
- An A/P system with check-writing capabilities;
- A banking system, which handles several accounts;
- A single-entry general ledger system;
- A mailing list system;
- An appointment calendar system;
- A set of business-oriented miscellaneous functions, such as Break-Even Analysis, Depreciation Schedules, Interest Calculations, Amortization Schedules and Quick Ratios.

Accounting periods are at the discretion of the operator, and all reports may be directed to either the screen or the listing device. The name and address file maintained by the Mailing List is compatible with most mail-merger word processors.

Business Finance Utility requires 48K of RAM, 320K of disk storage and an 80-column printer. All modules are written in compiled Basic, so execution is fast.

The package is available through First Release Software, 5814 Jester Drive, Garland, TX 75042, for $129.95. This introductory price includes the program disk and complete documentation. IBM PC-compatibles and most CP/M formats are supported. Reader Service number 470.

No Mirage for Commodore Owners

With Mirage Concepts' Word Processor program, Commodore owners can use an 80-column screen display without using any additional hardware. With Word Processor, the text displayed on screen can be formatted exactly as it will appear on paper.

Word Processor also features word-wrap, printed page-, line- and character-counters, more than 70 single keystroke commands, search and replace operations, block functions and the ability to interface to a myriad of printers.

Mirage also has announced the release of the Database Manager program for the C-64. This DBMS program can store, search, sort, retrieve, display, calculate and print reports, lists and even mailing labels.

The Database Manager features free-form design and input, the ability to sort on any field and at any level, and system parameters of 65,535 records per file, 2000 characters per record, 200 fields per record and 250 characters per field.

Both Word Processor and Database Manager are written in machine language, and each comes with a 200-page manual. The programs interface with one another, as well as with most of the database and word processing packages available for the C-64.

For more information, contact Mirage Concepts, Inc., 2519 W. Shaw, Suite 106, Fresno, CA 93711. Reader Service number 472.

Amper-Magic for the Apple II

Amper-Magic, designed by Anthro-Digital for the Apple II, gives Basic programmers the capability to add new commands to Applesoft with-

The Word Processor and Database Manager programs from Mirage Concepts are written in machine language and can interface with one another.

out the need to know machine language.

This menu-driven utility uses the ampersand function to access any number of machine language routines by name and without the need to know addresses. Your Basic program can then pass variables back and forth to the routines exactly as you're used to in Basic—no pokes or peeks are required. Amper-Magic will attach these routines using your choice of names, and it will take complete charge of their locations—you can edit your Basic program without regard to addresses.

The program's first disk includes Amper-Magic and 23 machine language routines; more Command Library disks are in preparation. You can also add your own relocatable routines from disk, or copy them directly from a listing in decimal or hex.

Command Library Vol. II gives you 27 more commands. More volumes are in the works, and other sources of routines, such as magazines, are readily available.

Amper-Magic Vol. I costs $75, and Vol. II is $35. Contact Anthro-Digital, Inc., PO Box 1385, Pittsfield, MA 01202. Reader Service number 463.

For Tax Time . . .

Three new versions of Design Trends' SofTax tax preparation and simulation system have been released. SofTax is now being used by professional tax preparers to perform the preparation of individual, corporate, trust and partnership returns.

The updated SofTax is available in these packages:

- Individual Version ($199)—For the user who prepares his own tax return.
- Preparer's Version ($499)—For the professional preparation of all 1040 forms and schedules for multiple clients. This version contains new features, including a batch print capability and an organizer form.
- Professional Version ($850)—For adding corporate, partnership and trust returns to the Preparer's Version.

SofTax features simulations and actual form preparation in all versions of the program. Data entry is simplified by the use of VisiCalc templates. All forms are printed for direct submittal to the IRS.

For more information, contact Design Trends, Ltd., PO Box G, Wilton, CT 06897. Reader Service number 467.

Apple Organizer

Great Divide Software, Inc., has released an organizing system for use on the Apple II, the Apple II Plus and Apple IIe computers with 80-column cards. Client Organizer is actually three programs in one: a business address book, an appointment calendar and a mail list organizer.

Client Organizer features a customized database system for convenient handling of company and client data. Information can be quickly sorted, saved or printed on any of the 15 record fields with user-selected range parameters; each file holds up to 100 individual client records with 15 vital fields per record.

The program produces screen or hard copy printout for all records, and it prints mail list labels with three options and variable line separations between labels.

Client Organizer is available from Great Divide Software, Inc., 7475 W. 5th Ave., Lakewood, CO 80226. It retails for $99.99. Reader Service number 468.

A Magic Upgrade For Word Processors

MagicBind, a $250 program from Computer EdiType Systems, upgrades word processing programs—including WordStar, Magic Wand and Electric Pencil—by augmenting their capabilities.

In addition to basic word processing functions, such as boldfacing, underlining (broken or solid), accenting and super- and subscripting, MagicBind provides more than 70 print-formatting functions text-editing aids and file-processing capabilities.

MagicBind is capable of text-screening on the CRT to check page breaks, true proportional spacing with kerning, automatic footnoting (up to 15 footnotes per page) with user-defined designations, automatic handling of "widows" (orphan lines), multicolumn printing, flexible page heading and footing and print-time file-merging. It also is capable of automatic numbering of chapters and paragraphs, printing labels, envelopes and form letters with personalized messages, and generating customized wills, contracts and other legal documents.

The program comes with documentation, a disk containing program and data files for demonstrating file-merge, and printing-form letters and labels.

MagicBind is available from Computer EdiType Systems, 509 Cathedral Parkway 10A, New York, NY 10025. Reader Service number 469.

"Honey, look! Memory chips!"

Pressing and Plotting On the IBM PC

Press'n'Plot is a color graphics screen capture-and-print facility for the IBM PC and Integral Data Systems' Prism printer, which is invoked by pressing shift-PrtSC.

Press'n'Plot lets you capture an image, print it, save it, enlarge it, clip it, intensify the colors, rotate it 90 degrees to the left or right and have it printed anywhere on a page.

In addition, you can print multiple images and multiple copies, you can change colors with ribbon selection and you can print images with a page of text. Press'n'Plot allows you to invert black-and-white portions of images, control printer ports, control paper movement from the keyboard and print screens of text. Press'n'Plot requires an IBM PC with PC DOS 1.1 or 2.0, 96K memory, IBM Color/Graphics monitor adapter and a color monitor, IDS Prism 80/132 printer with Prism Color Option and Dot Plot Graphics Option.

The program is available for $149 from American Programmers Guild, Ltd., 55 Mill Plain 17-5, Danbury, CT 06810. Reader Service number 462.

An Edge for IBM

The Leading Edge Word Processor is designed to maximize word processing efficiency on the IBM PC or compatible systems.

The program features a full set of print features, including boldfacing, super- and subscripting, underlining and double underlining. It also has a selection of character fonts and colors. Double-wide and double-high/double-wide characters are available, and text can be justified right or ragged right.

With the Leading Edge WP, you can print a text screen, an entire document or a section of text. In addition, you can print and edit at the same time, or copy files as you print or perform other word processing functions.

The Leading Edge Word Processor sells for $295 from Leading Edge Products, Inc., 21 Highland Circle, Needham Heights, MA 02194. Reader Service number 461.

Software for CBM

Midwest Micro, Inc., has released a pair of new software programs for Commodore-64 and VIC-20 users.

Designer Screens enables you to draw high-resolution pictures with a joystick, to make printed copies of the drawings in two sizes and to save the pictures to tape or disk for repeated use.

With Designer Screens, you can draw single points, narrow or wide lines or curvy or straight lines. Additional features include automatic line-plotting, text mode for adding captions, circle-plotting routines for pie charts and horizontal and vertical axis expansion of the printed image. You can also define background patterns, reverse images and control colors for borders, backgrounds and images.

Versions for the C-64, the VIC-20 with 5K and the expanded VIC-20 are available. Designer Screens supports VIC 1515/1525 and popular parallel dot-addressable printers. It retails for $29.95 ($1.50 for shipping and handling).

Smart ASCII Plus is the latest upgrade of Midwest Micro's software interface for parallel printers. The program allows Commodore keyboard graphics to be printed on most dot-addressable printers, including the Epson FX-80, Okidata's Microline 84, the Star Micronics Gemini-10 and the C. Itoh Prowriter.

Smart ASCII Plus has six print modes:

- Graphics—Prints out CBM graphics;
- Translate—Converts control characters into text for more readable listings;
- DaisyTranslate—Includes characters not found on most daisywheels;
- CBM ASCII—Prints all caps;
- True ASCII—Prints upper/lowercase for word processing;
- Pipeline—Streams characters to the printer with no modification.

Smart ASCII Plus is compatible with most application programs. It comes on cassette or disk for the C-64 and VIC-20, and retails for $59.95 (add $1.50 for shipping and handling).

For more information, contact Midwest Micro, Inc., 311 W. 72nd St., Kansas City, MO 64114. Reader Service number 471.

Charts and Art

For less than $200, you can have computer-aided drawing features normally found only on systems costing $20,000 and more. Charts Unlimited, which retails for $195, will run on the Apple IIe or II Plus with 64K.

With Charts Unlimited, you can define your own objects. The package starts with 36 predefined objects and 36 predefined symbols, but you can create your own alternate objects—up to 26 in one file. And there's no limit on the number of files.

Charts Unlimited can be used to draw flowcharts, floor plans, engineering drawings, electrical schematics, forms and virtually any type of chart.

Charts or drawings are created on a worksheet grid of 123 columns by 90 rows, and you can mix text with graphics anywhere on the worksheet. The package is menu-driven, and built-in help screens will answer most questions you might have.

For more information, contact Charts Unlimited, 5084 Mosiman Road, Middletown, OH 45042. Reader Service number 460.

Get a Feel for FFT

Red-Shift Software has announced 'Spectrum-64, a software package for those interested in studying or using the Fast Fourier Transform (FFT) on the Commodore-64.

'Spectrum-64 contains a multimode input, transform, save and high-resolution display program, as well as several utilities and sample data cases. The instruction manual details FFT for newcomers to that algorithm.

'Spectrum-64 is available for $79.95 ($59.95 for students and professors) from Red-Shift Software, PO Box 45488, Seattle, WA 98102. Reader Service number 474.

Edited by Dan Muse

Visualizing a Personal Computer
The Omnipotent Omni II
Memotech's Memorable Micro

A Visual Computer

Visual Technology, Inc. (540 Main St., Tewksbury, MA 01876), has announced the release of the Visual 1050 Personal Computer System.

The computer features two 400K disk drives, 96K RAM (expandable to 160K), high-resolution 640×300 bit-mapped monochrome display, printer port, modem port, Winchester disk expansion port and a detachable keyboard.

The Visual 1050 also features a library of software, including the MultiPlan spreadsheet package, WordStar 3.3 word processor, MailMerge 3.3 form letter processor, DR-Graph graphics package, GSX-80 graphics device driver, CBasic, A DEC terminal emulation package and the CP/M operating system.

Visual 1050 costs $2695, including software. Reader Service number 489.

An Intelligent Printer

The Facit 4528T is a near-letter quality intelligent printer. The printer's functions and special applications are controlled by an internal microprocessor.

The multipass 4528T incorporates a new design that provides a hinged cover, which is available in either a solid top with rear paper exit, or a slotted top for immediate tear-off directly above the tractors. The slotted top is particularly suited for ticketing and label applications.

The 165 cps Facit 4528T prints normal text, matrix characters and pin graphics. In standard text mode, the Facit 4528T produces near-letter quality characters, unidirectionally or bidirectionally with selectable boldface, condensed, extended and hybrid print systems. The printer is capable of printing in ten, 12 or 17 pitch, or proportional spacing. It can achieve a speed of 285 cps at 17 cpi.

The 4528T incorporates incrementing and decrementing counters for sequential label printing and message variations. Up to 10,000 repeat message label copies can be produced offline. These functions are directed by the internal microprocessor. You do not need to add special controllers or interface cards. This also frees the host system for other tasks.

The Facit 4528T is 7×14×24 inches and costs $1595. Facit, Inc., 235 Main Dunstable Road, Nashua, NH 03061. Reader Service number 490.

Multi Functions for The IBM

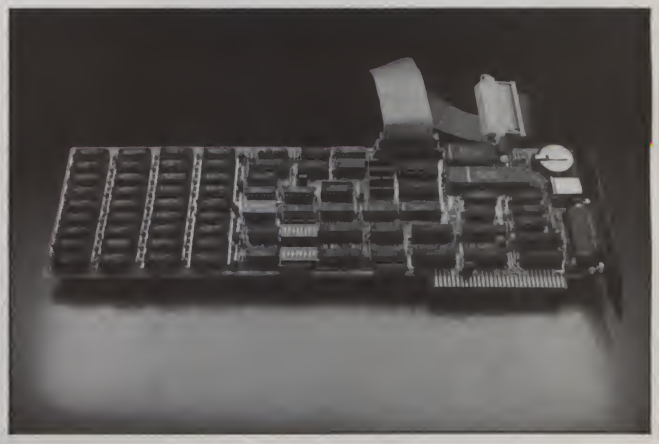
The RAM+3 is a multifunction card for the IBM Personal Computer or the IBM XT. The card gives you a time-of-day clock/calendar with battery back-up, a parallel printer port, an RS-232 serial port, and options for as much as 256K of additional RAM. The card also comes with Seattle Computer's (1114 Industry Drive, Seattle, WA 98188) Flash Disk software.

The RAM+3 card is designed to let you add commonly needed expansion features to the IBM PC or XT while saving both space and money.

Since the IBM's architecture provides only a limited number of expansion slots, the RAM+3 allows space for adding, for example, a hard-disk controller, a second CPU or a game card.

If you want additional memory, there are five options of RAM+3 available: 0, 64K, 128K, 192K or 256K versions can be purchased. For versions with less than 256K, sockets are provided that let

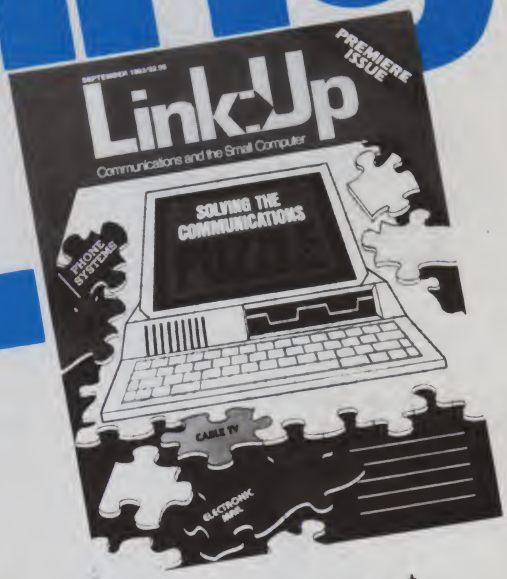
Visual Technology's 1050 personal computer features two 400K disk drives and 96K RAM (expandable to 160K). Included with the computer is a complete line of software.



The RAM+3 card, from Seattle Computer, is designed to provide commonly needed expansion features to the IBM PC or XT while saving both space and money.

Circle 300 on Reader Service card.

Nothing Else.



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The Omni II, from OmniLogic, Inc., is a logic analyzer combined with a full-function CP/M microcomputer.

The Memotech MTX-512 offers 80K RAM, hi-res graphics, a Z-80A processor and numerous hardware features.

you add more memory with 64K expansion kits.

The price of the basic, expandable RAM+3 is $210. The prices for the memory-expandable versions are $320, socket but no additional memory installed; $395, 64K installed; $470, 128K installed; $545, 192K installed; and $620, 256K. Expansion 64K Chip Kits are available for $80. Reader Service number 482.

A Dual-Purpose Portable

The Omni II, from OmniLogic, Inc. (PO Box 87, Renton, WA 98057), is designed to integrate the utility of a timing/state logic analyzer with a full-function CP/M microcomputer—all in a portable 27-pound package.

Upon being powered-up, the Omni II does an automatic self-check of its internal circuitry. The set-up page will then appear, allowing configuration of the machine for data collection. After data collection, the Omni II provides timing analysis, which is necessary for hardware troubleshooting. For software analysis, the Omni II becomes a state analysis machine.

The Omni II allows all test parameters and data—as well as time and date—to be stored on disk, with CP/M compatibility for additional off-line analysis.

As a CP/M computer, the Omni II utilizes a Z-80 CPU and 64K of RAM. It also features two 5¼-inch, double-density disk drives. The built-in nine-inch monitor displays 24 rows by 80 columns.

The ASCII keyboard is detachable with cursor-control keys and numeric pad. An RS-232C serial interface and a Centronics-type parallel interface are also included. Seven 232C serial interface, a Centronics-type parallel interface and seven CP/M programs (i.e.,

The Omni II is priced at $3950. Reader Service number 488.

Six-Pen Plotter

Hewlett-Packard (1820 Embarcadero Road, Palo Alto, CA 94303) has announced a six-pen graphics plotter call the HP 7475A.

The plotter accepts 11 × 17-inch or, 8½ × 11-inch paper, and overhead-transparency film. The HP 7475A's six-pen carousel is designed to produce a variety of multicolor pie, bar, line and text charts.

Because of its interface flexibility, its features and its software availability, the HP 7475A makes it easy to convert business data into graphics form. Two interfaces can be specified: the HP-IB (HP's enhanced version of the IEEE-488 bus) or RS-232C. The two interfaces provide compatibility with personal computers from IBM, Apple, Commodore, Compaq, DEC, Hewlett-Packard and others.

The HP 7475A's six-pen carousel lets you select specific pens by either front-panel controls or program commands. When returned to the carousel, pens are capped automatically to prevent dry-out. A variety of pen colors and widths is available.

Other features include a pen-velocity command for special drawing conditions, a view mode that stops plotting to allow you to review the chart being produced and a feature that rotates charts 90 degrees, making it easy to incorporate a horizontal chart into a vertical format.

The HP 7475A plotter weighs 13½ pounds and is 22.4 × 14½ × 5 inches. The plotter costs $1875. Reader Service number 492.

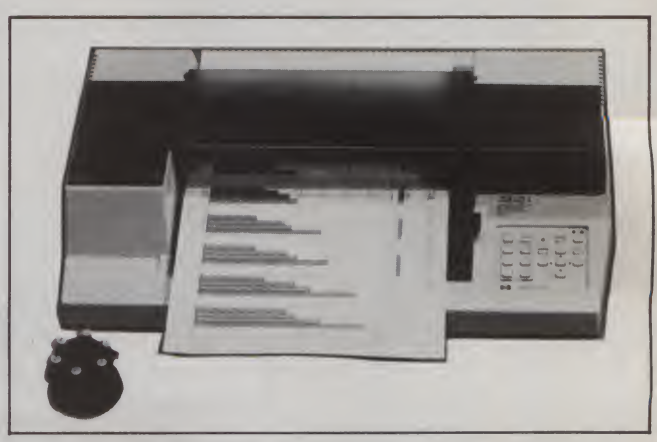
The Memotech Computer

Memotech Corp. (7550 W. Yale, Denver, CO 80227) has announced the release of the MTX-512 personal computer.

The computer features 80K of RAM and can be expanded to 512K, including 16K of dedicated video RAM. The MTX-512 also features 16 colors, 40-column text, 256 × 192 high-resolution graphics and moveable user-defined graphics (sprites) with all 16 colors available.

Standard outputs include: Z-80A processor running a 4MHz, two-game controller ports (joysticks), separate TV and video monitor ports, three-voice sound with hifi output plus a white noise generator, a dedicated games cartridge port, an uncommitted I/O port and a 2400-baud cassette port.

The MTX-512 also features a Z-80A processor running at 4MHz, a real-time clock, full moving keyboard with 79 keys—including eight/16 func-



The HP 7475A is a six-pen graphics plotter from Hewlett-Packard.

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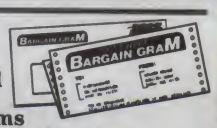

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MC883

DISCOUNT SOFTWARE

Circle 250 on Reader Service card.

CompuPro's MultiPro Model 10 MP is a four-user multiprocessor. It features a central 8088 processor and its main memory is dynamically allocated to each user with the Z-80B acting as a terminal handler for running 16-bit tasks.

tion keys, separate numeric pad and cursor control in four directions.

The computer's 16K of ROM contains several languages and routines that let both novices and experienced programmers take advantage of the MTX-512. Standard languages are Oxford Basic, with Logo-type commands, and Noddy. ROM routines include an assembler/disassembler with a special screen display of the Z-80.

Eight virtual screens enable programmers to define sections of the screen to work independently while maintaining all full-screen facilities. Pascal and Forth are available as add-on ROM packs.

The MTX-512 costs $595. Reader Service number 491.

Eight or 16 Bits

The MultiPro Model MP 10 is a four-user, multiprocessor microcomputer system that offers simultaneous execution of both eight- and 16-bit software.

The MP 10 features an 8 MHz, 16-bit 8088 central processor with one megabyte of memory, seven serial ports, including a modem port and Centronics printer port, 384K of solid-state disk memory, and two 5¼-inch floppy disks that store 1.6 megabytes.

The MP 10's integrated package allows simultaneous multitasking operation of both 8-bit and 16-bit programs under an enhanced version of CompuPro's MP/M 8-16—an operating system that lets you access more than 3000 business application programs. The computer also comes bundled with a menu-driven electronic spreadsheet, a word processor, and a database management system.

In the standard MultiPro configuration, each user terminal has access to its own Z-80B processor and dedicated memory for running 8-bit applications programs. The central 8088 processor and its main memory is dynamically allocated to each user with the Z-80B acting as a terminal handler for running 16-bit tasks.

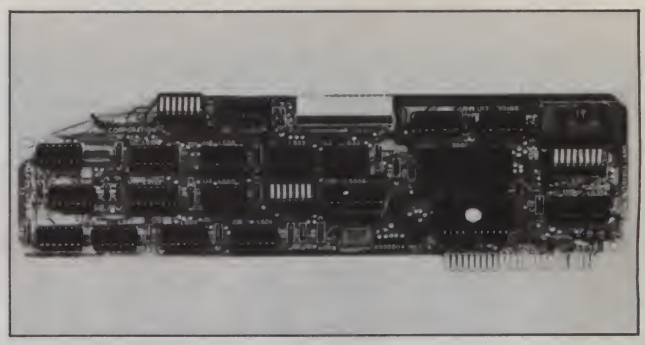
The MultiPro Model MP 10 costs $4995 and is manufactured by CompuPro, 3506 Breakwater Court, Hayward, CA 94545. Reader Service number 487.

Dualing Interfaces

Franklin Computer Corp. (2138 Route 38, Cherry Hill, NJ 08002) has released the Ace Dual Interface Card. It combines both serial and parallel interfaces on a single card, allowing Franklin Ace and Apple II computers to be connected to local and remote printers, display terminals, modems and other computers and accessories.

The parallel interface allows direct connection to Centronics and Centronics-compatible printers. The interface accommodates most parallel-mode dot-matrix printers. It may also be used with other accessories.

The bidirectional serial interface transmits and receives asynchronous data in serial form using an RS-232C interface. It operates at switch and program-selectable speeds from 45.5 to 38,400 bps.



The Franklin Ace Dual Interface Card combines both serial and parallel interfaces on a single card. It is designed to be used with the Franklin Ace 1000 and Apple II computers.

The serial data format can be selected using the computer keyboard. A menu showing choice of speeds, character lengths and parity and stop bit options can be displayed. The Ace Dual Interface Card is available for the Franklin Ace 1000 and Apple II computers. It costs $299. Reader Service number 480.

RS-232 Analyzer

Personal Computer Products (1400 Coleman Ave., Suite C-18, Santa Clara, CA 95050) has announced an RS-232 analyzer that is designed to provide easy diagnosis, monitoring and connection of any device or computer that uses an RS-232 interface.

The RS-232 Analyzer monitors nine RS-232 signals and displays their status using bi-color LEDs. In this way, high and low as well as changing signals can be monitored.

The Analyzer has internal switches that allow you to connect it from computer to computer interface.

The Analyzer is a plug-in type adapter and can simplify the task of connecting RS-232 devices such as letter-quality printers to personal computers from IBM, Apple, Tandy, or to any computer with an RS-232 interface.

The package costs $149.95. Reader Service number 483.

Add 27K to VIC

Legend Valley Computer Systems (1474 Naughtingham, Newark, OH 43055) has announced a new 27K internal expansion board to update your VIC-20 to 32K.

The board leaves all external user ports open for your convenience. The Legend Valley System of eight 2K RAM chips is completely deselectable in 8K blocks. It allows you to control RAM memory from 5K to 32K.

The board costs $129.95. Reader Service number 484.

The RS-232 Analyzer, from Personal Computer Products, lets you diagnose, monitor and connect any device or computer that uses the RS-232 interface.

Science and Your Timex-Sinclair

The FDZX1 Interface Board, from Group Technology, Ltd. (PO Box 87, Check, VA 24072), is designed to let you use the Sinclair ZX-81, Timex-Sinclair 1000 and 1500 microcomputers in automatic measurement, data acquisition and instrument control applications.

The Interface Board provides fully buffered access to address, data and control buses for I/O interfacing, plus six decoded device codes (expandable to 8) for convenient access. The board attaches directly to Timex-Sinclair computers and doesn't require an external power supply.

Two 14-conductor, six-inch cables with sturdy connectors are supplied to permit connection of the interface board to solderless breadboarding sockets (not supplied) on which interfacing circuits can be constructed.

The combination of the inexpensive Timex-Sinclair computers with the low-cost FDZX1 Interface Board is designed to help schools improve student-to-computer ratios. The interface also lets scientists develop affordable dedicated automation instruments for the laboratory or industry. The board allows hobbyists to exercise their imagination at an economic price.

The interface costs $69.95 in the kit version and $99.95 in the assembled version. This price includes the printed circuit board, all parts, two six-inch cables and instructions for I/O ports. The solderless breadboard is available for an additional $18. Reader Service number 481.

If the Lights Go Out

PTI Industries (4740 Scotts Valley Drive, Scotts Valley, CA 95066) has released a 200-watt power supply that is designed to protect personal computer users from altered and lost data due to power irregularities as well as complete loss of power.

The complete system comes with battery and two ac outlets. Installation is accomplished by plugging the unit between the ac outlet and the equipment to be protected. In the event of power loss, PTI's back-up power supply takes over and continues to supply 60Hz, 120 V power to your equipment. It costs $329. Reader Service number 485.

Free Your Printer

Axiom Corp.'s (1014 Griswold Ave., San Fernando, CA 91340) Wordstore is a 32K printer buffer that will work with most personal computers and printers.

Wordstore is designed to eliminate the need to tie up the computer to transfer data to a printer. Instead, data is dumped from the computer to Wordstore. Wordstore takes over the tedious task of communicating with the printer, leaving the computer free to handle other tasks. For example, it would normally take about 30 minutes to transfer a 20-page document from a computer to a printer. However, it takes only a minute to transfer the same amount of data from the computer to Wordstore.

Wordstore also offers a data compaction feature that allows repeated characters such as redundant words, underlines and spaces to be compressed so they don't take up as much memory. Wordstore's copy mode allows you to print multiple letters or documents, yet use only as much memory as would be required for a single message.

Wordstore is compatible with most computers and printers, and its parallel-to-parallel interface makes it simple to install. It costs $199. Reader Service number 486.

Wordstore, from Axiom, Inc., is a 32K printer buffer that operates with most personal computers and printers.

PTI Industries has introduced a 200-watt back-up power supply to protect personal computers from altered and lost data due to power irregularities and loss of power.

(From p. 146)

The documentation claims this increases speed. For the casual user, the increase in speed would be negligible.

The use of the master disk as a start-up key is a novel approach that Desktop has taken for copy protection. It does mean, however, that the master disk cannot be filed away safely. This creates a serious problem. In response, Desktop has modified its policy by providing a back-up disk for $35, if bought by a registered user within 90 days of purchase. This will become important, because while Graph 'n' Calc files can be backed up, the master disk cannot. The availability of the backup will allow protective storage of one copy off premises.

The manual, while beautifully illustrated and well-printed, is ring-bound. It effectively prohibits updates, local notes and replacement pages. Another approach should be considered. A standard three-ring binder cannot cost much more than the materials and labor for ring binding. Plus—the standard of software packages has moved towards the six-inch by nine-inch size.

The software is capable, within defined limitations. Those limitations might not be significant to the majority of businesses or school systems that have a need for its capabilities. For those people, this software will do the job. *(Desktop Computer Software, Inc., Suite 29-203, 303 Portrero St., Santa Cruz, CA 95060. $199.)*

Ken Lord
Winchendon, MA

VU-Calc

An inexpensive Spreadsheet program For the Timex-Sinclair

Why I Got VU-Calc

Despite its small size, the budget for my overseas English language teaching operation is complicated. For example, our main source of income—tuition—is paid in local currency, but expenses are in both dollars and local currency; salaries are paid in both. Since the local currency is not freely convertible into dollars, the program receives dollar subsidies.

These are some of the shifting sands on which my budget is built. Thus, I hoped that Sinclair's program VU-Calc for the Timex-Sinclair 1000 might help with the intricacies of my financial planning, showing the effects of such variables as the number of students enrolled, fees, salaries, the ability to convert local currency and the exchange rate.

When the program arrived, I was eager to try it out. The first thing I did was examine the documentation, which is in the form of a cassette package insert. Because the instructions are in this form, each page is the size of a cassette tape box—about 2¾ × 4¼ inches. Not only are the pages small, but the print is tiny as well. In fact, most people would probably find it uncomfortably small. However, I mastered the small print, and was able to effectively evaluate the documentation.

Good documentation must do two things: first, it must lead first-time users through the program; second, it must provide an easy reference for nonnovices who have a question about some aspect of the program.

While I was generally happy with the program, I did feel the effects of some limitations.

In both areas, the VU-Calc instructions do a passable job, though they could have done better. For example, in explaining the difference between absolute formulas and relative formulas, the analogy of simple and compound interest was used. For me, this analogy confused more than it clarified.

It would have been better to have omitted the analogy entirely, sticking instead to the explanation and examples.

For experienced users, the documentation is helpful but could be improved. For example, in a list of error-report codes, one error-code explanantion contains no instructions to explain what to do when this error occurs. Since the needed command, GOTO 9000, is the only thing that will restart the program with the data intact (other commands cause the data to be lost), this instruction should have been put in the error-code explanation rather than later in the text. In general, however, the documentation is helpful to experienced users. Once loaded—a process that takes approximately 2½ minutes—VU-Calc provides a table of 26 rows by 36 columns.

You can picture it as a piece of graph paper with large squares. Down the left-hand side of the page are the letters A–Z, one for each row. Across the top are the numbers 1–36, one number labeling each column. In each square, identified by its row letter and column number (e.g., B03 or Y25), you can write titles, numbers or formulas. You write titles so you can remember that line E is, for example, Joe Andropoulos's hourly wage, your life insurance premium or the prime rate. Whatever title you use must be a maximum of eight characters, (for example "JA $/HR," "LIFE INS," or "PRIME RT") In other boxes you enter numbers. Thus, if the prime rate is 15 percent, you enter .15 in the appropriate box.

The third possibility is to enter a formula in a box. For example, you want the total of three figures that are located in boxes B03, C03 and D05. Therefore, you enter the formula B03 + C03 + D05.

The formula itself is displayed at the bottom of the screen. Once the instruction to calculate is given, the numerical result of the formula (in this case, the sum of three numbers) is displayed in the box where you entered the formula. Change one or more of the figures in B03, C03 or D05, press the calculate key, and the new total will be displayed.

One strength of the program is its ability to handle formulas. A formula can be entered once, then copied along a row or column simply by entering three commands. I used this feature in such places as yearly totals, which are simply the totals of my three trimesters.

I entered the formula in the top row and had it copied down the column. This saves a lot of typing. Additionally, the program allows you to copy formulas in boxes that are not along a straight line, adding further flexibility.

I didn't master VU-Calc immediately. Twice I lost all my data through an unfortunate series of commands, which I now know how to avoid. Despite this being the first time I had used any electronic spreadsheet program, I was able to learn how to use the program and enter my budget in working order in just one evening.

Once the data was entered, I could play with the figures. What would happen, for example, if the exchange rate fell from the current 4.633 to 4.5 next trimester? I entered the new number in the appropriate box, pressed the calculate key, and in a few seconds my entire budget was updated accordingly, including individual figures and final totals. It gave me a great feeling of power. I could now change several figures and know in a few seconds what the results would be.

I saved the program, with all of the figures I had entered, on cassette tape in order to have a permanent record of my work. Now when I need to work with the budget, I can load the tape, and all the figures are there. I should point out that the program with all the variables saved now takes five minutes to load.

While I was generally happy with the program, I did feel the effects of some limitations. Most of the limitations can be summed up in one word: size. For example, while 26 rows sounds like a sufficient number, it is surprising how fast these

are used up. More critically, the program displays only nine rows and three columns at one time.

While you can rapidly move to any part of the larger (26 × 36) table, it is unsatisfying not to see everything at a glance. Additionally, as you move across the table, your titles move off-screen. You might look at a display of numbers but not remember what they mean. If you have a printer for your Sinclair, you will realize that it can print only nine rows and three columns at once. Finally, individual boxes can hold only numbers that are smaller than 100 million. Numbers with nine or more digits are automatically truncated, a process that can result in large undetected errors.

Another drawback to the program is its inability to perform certain editing functions. Specifically, there is a need to be able to take a line of data and move it to a new part of the table. This can be useful if you forget to enter a line of data, or if you want to expand the table. However, with this program you either have to begin again with a blank table, or delete the necessary data box-by-box and reenter it box-by-box in the new location.

Having experienced the possibilities and limitations of VU-Calc, I can say that it does its job well. While I probably save a few minutes here and there by avoiding pencil, paper and calculator work, the greatest advantage of VU-Calc is the ease with which I can investigate the effects of individual changes on my budget as a whole.

In a few seconds, I can discover the result of any hypothetical situation presented in the framework of the table I have created. This gives me deeper insight into my budget.

Besides using VU-Calc to plan my business finances, I was able to do some personal financial forecasting concerning Interest Retirement Accounts (IRAs). It was easy to enter three initial figures—a $2000 initial contribution, my age and the date.

Then I added three formulas—one to increase the IRA by $2000 each year plus interest, the second and third to update my age and the date year-by-year.

A press of the calculate key gave me a table showing how much money I would have in what year and at what age. Later, I added a fourth line that showed the amount of contributions so I could compare it with the total in the IRA account.

In summary, VU-Calc is a useful tool for handling tables of numbers, provided that the disadvantages of size mentioned above are not critical. The speed with which the program calculates tables of data not only saves you time, but also encourages you to explore new areas of investigation. *(Sinclair Research, Ltd., 3 Sinclair Plaza, Nashua, NH 03061. $14.95.)*

Robert Nielson
Buffalo, NY

Quikpro II

Create programs for Your Osborne, without Having to program

I've just encountered what appears to be the most beneficial software program for Osborne users who want programs without having to program applications. It's called Quikpro + II and is designed to generate Basic applications programs. It does a super job.

The program features—

- Quikpro filing program generator
- Quikpro automatic instructions
- Quikprint—report program generator
- Quikindex—file indexing utility program

Generating the Filing Program

A program generator has certain requirements. It must allow you to define the type, size and nature of the data; it must also provide the mechanisms for capture. Thus, the generated program must present a data capture screen. This is done by presenting a drafting screen in which the lines are lettered. All but two screen lines are lettered.

The bottom two lines let you communicate with Quikpro + . All you have to do is to identify which line you want to designate for data; when the program takes you to that line, you must enter the "stub," or title of the data, followed by enough equals signs (=) to define the length of the data entry to be captured. When you have defined all fields, Quikpro + will number them and begin to ask questions about them.

The data definitions that you define now become variables to the Basic program that will be generated. The stub becomes a part of the screen that the generated program will show, and the entry will become the name of the variable that will be filled by the entry you make at that point. This information is used to define the disk record that will contain the data. One of the fields of that disk record is know as a "Key." It is the means by which the data is to be filed. The Key, or Primary Key, as the documentation calls it, must be unique. Quikpro + asks you to designate which field will be the Primary Key.

Since some of the data will be numeric, you're asked by Quikpro + to identify those fields. Data that will be edited, such as dollar data, must be stored in a special way. So it's necessary for you to identify the format of the numeric data. If you have a seven-digit whole number (integer), enter 7. And if you have a dollar field with three integers and two decimals, enter 3.2. These features also provide input editing.

Quikpro + lets you perform calcula-

tions on data by allowing the specifications of calculations and accumulations. It asks you what, if any, such fields they are.

This is done by specifying the field number and the nature of the calculation in simple algebraic formats. An example would be F#(1)*10/F#(2); this would multiply field #1 by ten and then divide it by field #2.

This program will even test your calculation to make sure that it is "legally possible" before it will include the calculation in the generated program.

The program depends on your comments to assist it. For that reason, you're asked to enter field comments, detailing the nature and size of the data to be entered there. That information will be included in the program in Remarks statements and in the operations manual, which the program generates.

You're asked to assign a name to the data file to be used. This name must not exceed eight characters—and please make the characters in alphabetical order. Similarly, you're asked to give the program a name, which will be identified as a Basic (.BAS) program on the disk. You can identify a special file for automatic documentation (option 2 on the main menu).

The screen you develop can be printed—if you have a printer. The program gives you that option. But if you don't have a printer, don't request the option, because you'll lose the work you have done to that point.

Once the program has been created, you can do anything with it that you would do with any Basic program. While you must know some Basic rules, you don't need to know how to program to use Quikpro+.

Operating the Generated Program

Every generated program will have four options:

- (A)dd record
- (G)et record
- (S)earch
- (E)nd program

The add option lets you enter data to your data files. The cursor goes to the first field you have defined, and one by one you enter data.

The get option lets you locate a record for display or for change. The record key is requested and then you're given the option to change or delete. If you merely press the return key without specifying one of those options, you return to the program's main display.

The search option is similar, except that you must use it to find a record when the record key is not known. You can look for names or other known data. You must move the cursor to the field on which you will perform the search, indicate the logics of the search (i.e., equal, less than, greater than), and press the return key. You get what you request. Finally, the end option stops the program, taking you back to Basic.

What is Automatic Documentation?

Quikpro+ will allow you to print an instruction manual for each program created. It is here where the instructions you have entered in the program will be prepared in manual form.

The Report Generator Option

This option generates a separate program for the extraction of data from the file and the presentation of that data in an intelligible format. To do so you must load the screen and then tell the generator whether you want a freeform or columnar report program. For form letters, mailing cards, labels or other forms, you would need freeform designation. Financial reports would require columnar reports.

You will be asked to designate certain physical characteristics of your report. While the two procedures are different, the concept is the same.

Designing the report is similar to defining the screen. In this instance, the screen lines are numbered. With the report generator you're given four options: <E>dit report, <P>rint report layout, <L>ook at record layout and <D>one.

Quikpro+ does more than it appears to on the surface. It's a good product and worth the money.

Looking at the record layout will remind you of the contents of the file. The report layout is a form that you must edit. Editing includes the placement of headings and the identification of data to be positioned.

You can print the report layout and examine the record layout. From that point, you're asked about the fields to be totaled and for the name of your report. Then Quikpro+ takes over, generating the program.

Each report program will have these options:

- (G)et
- (S)earch, sort, select
- (E)nd

The get option will request a key and report all of the records containing that key. This is not the primary key used to file the record.

The search/sort/select option lets you perform string searches, specific field searches, logical searches, inclusive searches or combinations of these prior to printing the report. Searching may be done <A>nywhere in the file or on <F>ields. Sorts may be specified. The <P>ause, <A>bort or <R>edo options give you full printing control.

The manual offers technical help and is well-done and easy to follow. My only recommendation to ICR FutureSoft is that it include a tutorial that leads novices through a complete practice example.

The program does more than it appears to on the surface. It's a good product and worth the money.

Quikpro+ II is also available for the IBM PC, eight-inch CP/M systems and the Radio Shack TRS-80 Models I, II, III, IV, 12 and 16. *(The ICR FutureSoft, PO Box 1446, Orange Park, FL 32073. $149.)*

Ken Lord
Winchendon, MA

HES Writer

A competent Word processor for the Bare or expanded VIC

HES Writer is part of the low-priced crop of word processors currently available for the VIC-20. It will allow a manuscript of any size to be typed in, edited and then printed as one document from your bare or expanded VIC.

Typing on the VIC's full keyboard is a pleasure for the touch typist, and the INST DEL key means that at last you can throw your eraser away.

The VIC has that small 22-column screen, but characters are clear and legible even on television sets that would show fuzzy spots for letters at 40 columns.

HES Writer is easy to learn and comes as a plug-in cartridge that fits the VIC's expansion port. Some 1500 bytes of RAM are used for scratch and input/output; the rest is yours. In a bare VIC that's about 2000 characters.

When a motherboard and extra memory are switched on with the program, over 20,000 characters are available at once. Designing a program that runs on the bare VIC does lead to compromises that we'll cover later.

Its Best Features

The first thing you'll notice with HES Writer is that words are not split up on the screen. If a word overflows the present entry line, the whole word is scooted down a line and kept intact.

Less exotic word processors will allow the word to start on one line and finish on the next. It is rare that this doesn't lead to at least one spacing or spelling error. This feature will save you money in paper and printer wear and tear.

You can copy text from one place to another simply by jotting down the starting and ending line numbers and the des-

tination number. This text can be replicated or just moved. Character and screen color are under the control of the operator, so you can set them for the best use with your TV.

When you enter text, it has to have format instructions, which are printing instructions, scattered around. These instructions make the printed output look just the way you want it, but add superfluous characters to your text on the screen. It doesn't look the way it will when printed.

I was amazed and delighted to use the preview command and to see the formatted output on the screen. The format instructions are gone, but their effect is there. This nice feature is often omitted from word processors that cost much more than HES Writer.

Screen preview will eventually recover the entire cost of the program in paper saved. Granted, the formatted output looks weird on the VIC's small display, but you can see where page margins are crossed, and you will soon be avoiding minor errors that would otherwise force you to reprint a page.

The program comes up in Entry mode. You can change the mode of operation anytime by entering a single letter on an otherwise blank line. The first letter of the following will put you in that mode: copy, delete, disk, edit, find, insert, list, numbered-list, print, preview, read (files), tape and write.

The screen border changes color to reflect the active mode of operation. The normal mode of entry has a green border. List and numbered list (the display modes) sport blue borders, find has yellow, and delete (of course) has red.

Format controls are invoked within text by typing an up arrow and then a format command. These commands set margins, justification and centering. In addition, they locate the optional header, set indents and spacing, place the page number, and chain to any of the next text files.

Files can be brought in either as an add, or as a replace. If you have text you would like to add to other text, you can bring in one file, then add the second.

Getting Hard Copy

Your printer must be able to list your programs to work properly. Printing is slow, maybe half the speed obtained while listing programs on an Epson FX-80. Output looks good; no one would ever suspect that it came from a little VIC.

Paper can be any size that fits the printer. Pages can be numbered automatically starting anywhere, and a header at the top of each page can be included. You can select single, double or triple space. There are no special printer commands, so you will want to enter any smart printer commands for double strike or other options before you bring HES Writer on.

There Are Limitations

One of Murphy's laws states that every solution breeds new problems. A program designed to fit into a bare VIC will be different than one requiring memory expanders. A case in point: this program doesn't have a disk command structure. What does that mean? The good news is that you can read and write to disk just as easily and much more quickly than you can using a cassette. The bad news is that you cannot do disk management jobs while in the program; you must do these housekeeping chores before you turn HES Writer on.

This is OK as long as you keep formatted disks around to use for word processing, and you should. The worst effect of this is that you can't look at disk directories. You have to know the name of your file before you start, just like you read your map before getting on the turnpike. This will impose more discipline on you as you graduate from cassette to disk, but you may be so happy to have the disk that you won't care!

The editor in HES Writer is line-oriented, so you won't get the convenient full-screen editing capability you have while programming on the VIC. The edit feature is essentially limited to corrections, so you will find that the entry and copy commands make the most straightforward way to handle revisions.

Instruction Manual

The 16-page instruction booklet is succinct, but relatively complete. All of the mode and format controls are summarized on the first two pages, which then become a quick reference. The remaining pages then elaborate on these one-line summaries. The first thing to add would be some examples.

Experienced word processor users will be able to make things work quickly because of this direct style. Those interested in word processing for the first time will have to learn by going through the functions one at a time.

Summing It Up

You should consider this program for your word processing needs if you wish to start with an unexpanded VIC-20 and a simple printer, especially if you will be handling documents in the range of two–ten pages. *(Human Engineered Software, 2275 East Bayshore Road, Palo Alto, CA 94303-3269. $39.95.)*

Ron Gunn
Livermore, CA

Business Graphics in Spreadsheet Fashion
A Spreadsheet for Your Timex-Sinclair
Generate Osborne Applications Programs
Another Low-Priced VIC-20 Word Processor

Graph 'n' Calc

Prepare visuals
With ease
For your IBM PC

Graph 'n' Calc, from Desktop Computer Software, approaches the preparation of business graphics from the data entry perspective—in the form of a spreadsheet.

The package is somewhat limited because the selection of colors and the maximum number of data items are limited by the memory design point.

The package is, however, a competent tool for the preparation of visuals for on-screen slide shows, plotted outputs to paper or transparency, and printed output to a graphics printer or to a normal printer for data reports.

In the manufacturer's own words, "Graph'n' Calc is an integrated system that provides the capability to easily enter data into an array, prepare color graphs using the data, perform complex analysis of the data, and save and retrieve data from external storage." The key word is "easily." It is easy.

Several types of graphs may be prepared: line, side-by-side bar, stacked bar and pie. You may also prepare hi-low or close-volume charts; this may be of interest if you follow the stock market. The approach to building them—a "window" approach—makes the package one of the easiest to use.

The tutorial is probably the most positive feature of this package. It shows educational orientation as it leads you quickly into successful use of the package. The tutorial works successfully because of an internal default system that works with a base file supplied with the system.

As mentioned, a "window" approach is taken with this software. Displays used in the Graph 'n' Calc package are in two parts: the set-up and the actual picture. If you are fortunate enough to be able to use monochrome and color displays, the set-up and all text will appear on the former while the actual pictures appear on the color monitor.

The package was tested using an Amdek Color II monitor and a Plantronics color board. This achieved excellent results. It was also used with equal success on the Compaq Portable Computer (which has an intrinsic color board).

The set-up screen is made up of three windows. The top window is used for the data, in spreadsheet fashion, with appropriate headings, for a matrix of ten rows by 100 columns.

The middle window contains the command sequences for the various operations to be performed. The parameters under which the operations will be performed are displayed in the bottom window. These include the starting and ending rows and columns, whether or not there will be a grid placed on the picture, titles placed on the axes, background color selection and so on.

While Graph 'n' Calc will accept data directly from the keyboard, its outstanding features are the ability to obtain data from Data Interface Files (DIF), produced by packages such as VisiCalc or SuperCalc, and to prepare its plot using that data.

The limitation of size (10 × 100) means that very large spreadsheets cannot be used, so that must be a consideration. Graph 'n' Calc will also accept files in a text format, allowing you to extract data from a word processing file. The process works the other way as well. Files may be produced by Graph 'n' Calc in the DIF format, allowing the development of data within the Graph 'n' Calc system to be used in a spreadsheet package.

The package includes an excellent step-by-step tutorial. It is well-done and easy to read, and it assures early success.

Data for Graph 'n' Calc can be easily formulated to perform certain calculations within the data window. The package also contains extensive statistical functions that are of immediate value for these persons whose functions require forecasting. Because of the tool's intrinsic statistical functions, the package is accompanied by an excellent book, *Fundamentals of Forecasting*, by Sullivan and Claycombe.

The ease of data entry, plotting and flexibility of the software are this package's outstanding features. The data is easily entered and if done using a color monitor, colors change such that the user is fully informed as to what is happening.

The package could be improved by letting you move from column to column or row to row automatically (selectable) after data has been entered.

Currently, the return key is hit and then it must be followed by an appropriate arrow key. Movement around the matrix is easily accomplished by an Alternate/Go function. Movement around the software is by single key selection (forward) and the escape key (backward).

Visual plots, once prepared, may be filed on disk and recalled for slide-show presentations. Optional modules for plotting on the Hewlett-Packard 7470A and Strobe 100 graphics plotters can be purchased separately. The asynchronous communications adapter costs about $150.

Graphics printers are available from a variety of sources, as are color boards and monitors. The software was first tested using a Plantronics Color Graphics Adapter ($475) from Frederick Electronics, PO Box 502, Frederick, MD 21701.

The software was marked to be workable on the Compaq Portable Computer. It was also tested there, with comparable success, though without the enhanced color. However, if the package is workable on the Compaq, which has a 128K minimum memory, then Desktop should consider modifying the software to allow for a larger matrix and removing the concern over the size of the spreadsheet.

A compiled version of the software is available for an additional $100. There is, however, a memory requirement of 128K and a media requirement of at least one double-sided disk drive or a hard disk.

(Continued on p. 142)

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